ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

Building 707 Closure Project Decommissioning Operations Plan

FINAL DRAFT

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RECORD OF MODIFICATIONS

DOP Modification #	Effective Date	Description

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ACRONYMS AND ABBREVIATIONS

AB	authorization basis
ACM	asbestos containing material
ALARA	as low as reasonably achievable
Am	americium
ANSI	American National Standards Institute
APEN	Air Pollutant Emission Notice
AR	Administrative Record
ARARs	applicable or relevant and appropriate requirements
ASF	Activity Screening Form
ASQC	American Society of Quality Control
AST	aboveground storage tank
Be	beryllium
BIO	Basis for Interim Operation
CA	Contamination Area
CAB	Citizens Advisory Board
CAQCC	Colorado Air Quality Control Commission
CCA	Configuration Control Authority
CCR	Code of Colorado Regulations
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHWA	Colorado Hazardous Waste Act
CHWR	Colorado Hazardous Waste Regulations
CID	Cumulative Impacts Document
cm	centimeter
CO_2	carbon dioxide
COOP	Conduct of Operations
CPB	Closure Project Baseline
CWA	Clean Water Act
DDCP	Decontamination and Decommissioning Characterization Protocol
DNFSB	Defense Nuclear Facilities Safety Board

DOE	U.S. Department of Energy, Rocky Flats Field Office
DOP	Decommissioning Operations Plan
DOT	U.S. Department of Transportation
dpm	disintegrations per minute
DPP	Decommissioning Program Plan
DQO	data quality objective
ECATS	Environmental Compliance Action Tracking System
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ES&H	environmental safety and health
FDPM	Facility Disposition Program Manual
FUD	Facility Use Decision
FY	fiscal year
HASP	Health and Safety Plan
HVAC	heating, ventilation and air conditioning
IGD	RFCA Implementation Guidance Document
IHA	Integrated Hazards Analysis
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
ISMS	integrated safety management system
ISSRS	in-situ size reduction system
ITDC	inner tent demolition chamber
IWCP	integrated work control program
JHA	job hazards analysis
JHIT	Job Hazards Identification Tool
LL	low-level (waste)
LLM	low-level mixed (waste)
LOQI	list of qualified individuals
LRA	lead regulatory agency
µg/l	micrograms per liter
MOU	Memorandum of Understanding
mrem	millirem

MSDS	Material Safety Data Sheet
N/A	not applicable
nCi	nanocurie
NCP	National Contingency Plan
NDA	non-destructive assay
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
NTS	Nevada Test Site
ORR	Operational Readiness Review
OS&IH	occupational safety & industrial hygiene
OSHA	Occupational Safety and Health Act
PAC	Potential Area of Concern
PAM	Proposed Action Memorandum
PATS	Plant Action Tracking System
PCBs	polychlorinated biphenyls
PDS	pre-demolition survey
PDSR	Pre-Demolition Survey Report
PE	professional engineer
PEB	pre-evolution briefing
PEP	Project Execution Plan
PMP	Project Management Plan
POD	Plan of the Day
POW	Plan of the Week
PPE	personal protective equipment
psi	pounds per square inch
Pu	plutonium
PU&D	property use and disposition
PuSPS	Plutonium Stabilization and Packaging System
QA	quality assurance
RA	Readiness Assessment
RAAMP	Radioactive Ambient Air Monitoring Program
RCRA	Resource Conservation and Recovery Act

RDM	Readiness Determination Manual
rem	radiation equivalent man
RFCA	Rocky Flats Cleanup Agreement
RFCLOG	Rocky Flats Coalition of Local Governments
RFETS	Rocky Flats Environmental Technology Site
RLC	reconnaissance level characterization
RLCP	Reconnaissance Level Characterization Plan
RLCR	Reconnaissance Level Characterization Report
ROSRS	Remote Operations Size Reduction System
ROV	remote-operated vehicle
RSOP	RFCA Standard Operating Protocol
RWP	radiological work permit
SCO	surface-contaminated object
SES	safety evaluation screen
SHPO	State Historic Preservation Officer
SME	subject matter expert
SNM	special nuclear material
SOE	stationary operating engineer
SPCC	Spill Prevention, Control, and Countermeasures (Plan)
SQAM	Site Quality Assurance Manual
STP	Site Treatment Plan
TRM	transuranic mixed (waste)
TRU	transuranic (waste)
TSCA	Toxic Substances Control Act
TSD	treatment, storage, disposal (facility)
TU	(RCRA) temporary unit
U	uranium
UBC	under-building contamination
UCNI	Uncontrolled Classified Nuclear Information
UIC	underground injection control
USQ	Unreviewed Safety Question
USQD	Unreviewed Safety Question Determination
UST	underground storage tank

VOC	volatile organic compound
WAC	waste acceptance criteria
WCD	work control document
WCF	work control form
WIPP	Waste Isolation Pilot Plant
WQC	water quality criteria

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EXECUTIVE SUMMARY

The Building 707 Cluster is comprised of Buildings 707, T-707S, 708, 709, 711, 711A, 718, 731, 732, 778, and 21 aboveground storage tanks, all of which are located within the Protected Area (PA) of the Rocky Flats Environmental Technology Site (RFETS or Site). Closure of the Building 707 Cluster is necessary to meet the goals of the Rocky Flats Cleanup Agreement (RFCA) and the Rocky Flats Closure Project Baseline (CPB).

Buildings within the Building 707 Cluster were constructed in the 1970s to house manufacturing processes designed to produce weapons parts from plutonium, uranium, beryllium, and stainless steel. Hazards associated with the related casting, forming, metallurgy, machining, and assembly operations included radiological and chemical contamination on building surfaces and in building equipment and systems, and physical hazards common to standard industrial environments. Some areas within the Building 707 Cluster have levels of radiological contamination exceeding 2,000 disintegrations per minute (dpm)/cm^2 removable and 50,000 dpm/100 cm^2 fixed plus removable. In addition, asbestos is present in ceiling tile, floor tile, and insulation; beryllium contamination has been found in gloveboxes and other equipment; and organic solvents reside in tanks and ancillary equipment.

With suspension of nuclear weapons production operations at the Site in 1989, and subsequent discontinuation of the production mission in 1991, activities within the Building 707 Cluster were re-directed to support the Rocky Flats Vision of safe, accelerated, cost-effective closure. In accordance with the current decommissioning schedule for the Building 707 Cluster, facility components will be decontaminated, size reduced, and/or removed from the buildings and the buildings will be demolished by June of 2005. At that time environmental restoration activities will be undertaken to remediate any soils, groundwater, and/or surface water contaminated as a result of building operations.

For planning purposes, the Cluster was divided into small, manageable groupings of similar equipment and rooms that can be worked independently. A total of 17 groups, or SETs, were defined for the Cluster. Next, the SETs were prioritized to establish the order in which they will be decommissioned, taking into account such factors as physical constraints, personnel and environmental safety and health (ES&H), operational/technical issues, management issues, costs, and waste generation issues. The RFETS Decontamination and Decommissioning Characterization Protocol (DDCP) was then used to complete a reconnaissance level characterization (RLC) for each SET. Results were documented in the Building 707 Closure Project Reconnaissance Level Characterization Report (RLCR), which identifies the presence of radiological and chemical contamination in many of the SETs. Following the RLC, component removal, size reduction, decontamination, and demolition methodologies were examined to complete the development of the decommissioning sequence.

In accordance with the RFETS Decommissioning Program Plan (DPP), buildings with significant contamination or hazards (i.e., Type 3 buildings) and buildings without significant contamination or hazards, but in need of decontamination (i.e., Type 2 buildings), will be decommissioned in accordance with this Decommissioning Operations Plan (DOP). Buildings within the Cluster that are free of contamination (i.e., Type 1 buildings) will be decommissioned using Site procedures upon notification to the Lead Regulatory Agency (LRA), (i.e., the Colorado Department of Public Health and Environment [CDPHE]). Based upon their review of the RLCR, DOE and CDPHE concur that Building 707 is a Type 3 facility, Buildings 708, 709, 718, 731, 732, 778, and one of the aboveground tanks (i.e., Tank T-206/D-2, containing carbon tetrachloride) are Type 2 facilities, and the remaining buildings and tanks located within the Cluster are classified as Type 1 facilities. Therefore, the scope of this DOP is limited to Buildings 707, 708, 709, 718, 731, 732, 778 and Tank T-206/D-2.

Consistent with the objectives of RFCA, the Building 707 Closure Project team will select decommissioning techniques based on a variety of factors, including potential ES&H hazards, secondary waste generation, and cost-effectiveness. Performance specifications for the techniques will include meeting the applicable release criteria and waste acceptance criteria (WAC) of treatment, storage, disposal facilities; minimizing the generation of hazardous, radioactive and secondary wastes; minimizing ES&H impacts; and complying with the applicable or relevant and appropriate requirements (ARARs).

The Building 707 Closure Project team will perform decommissioning activities upon completion of appropriate reviews in compliance with Site programs and procedures, including the RFETS integrated safety management system (ISMS), which incorporates the Site integrated work control program (IWCP), readiness determination program, integrated environmental management program, and quality assurance program. Site requirements will be applied based on a graded approach (i.e., more rigorous requirements will be applied to facilities with greater hazards). In addition, personnel and environmental monitoring systems will be used, including Site-wide and project-specific air, surface water, and groundwater monitoring systems as described in the RFETS Integrated Environmental Management Program Manual and Site Integrated Monitoring Plan.

Environmental impacts resulting from the Building 707 Closure Project will contribute incrementally to potential Site-wide cumulative impacts associated with the overall RFETS Closure Project. Given the existing industrial setting of the Building 707 Cluster, environmental impact issues associated with the Project are relatively limited.

Throughout the course of the Building 707 Closure Project, personnel of the U.S. Department of Energy, Rocky Flats Field Office (DOE), the contractor and subcontractors, and the regulatory agencies (i.e., CDPHE and the Environmental Protection Agency [EPA]) will use the RFCA consultative process to establish and maintain effective working relationships with each other and with the general public. Decommissioning activities will be documented in the Building 707 Closure Project Files, RCRA Operating Record, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Administrative Record (AR) File. Upon completion of decommissioning activities and final characterization, a Building 707 Closure Project Decommissioning Final Closeout Report will be prepared for review and approval by the LRA.

1.0 INTRODUCTION

In 1996, the U.S. Department of Energy, Rocky Flats Field Office (DOE), the Environmental Protection Agency (EPA), and the Colorado Department of Public Health and Environment (CDPHE) executed the Rocky Flats Cleanup Agreement (RFCA).[1] RFCA is the Federal Facility Compliance Agreement and Consent Order negotiated pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)[2], the Resource Conservation and Recovery Act (RCRA)[3], and Colorado Hazardous Waste Act (CHWA).[4] RFCA provides the regulatory framework for attaining the goals expressed in the Rocky Flats Vision.[5]

The overriding goal for Rocky Flats is to achieve accelerated cleanup and Site closure in a manner that is safe to workers and the public, and protective of the environment. As discussed in the Rocky Flats Closure Project Management Plan[6], DOE intends to disposition all special nuclear material (SNM) and regulated wastes, demolish facilities, and remediate contaminated areas to the extent that future land uses are enabled and downstream water supplies are protected. Site closure is currently scheduled for completion in December of 2006.

1.1 Alternatives Analysis and Selection

To determine the most efficient path to accelerated cleanup and Site closure, the RFETS Facilities Use Committee was tasked with evaluating three alternatives for the near- and long-term management of RFETS facilities[7]:

- Alternative 1 - Decommissioning (i.e., component removal, size reduction, decontamination, and demolition),
- Alternative 2 - No action with safe shutdown maintenance (i.e., mothballing), and
- Alternative 3 - Facility reuse.

The results of this analysis are summarized in Table 1. As discussed in the Facility Assessment for the Industrial Area Reuse Study[8], Alternative 3 is neither required nor beneficial because Site cleanup and closure would be deferred but not eliminated. Similarly, Alternative 2 fails to accomplish the Rocky Flats Vision, resulting in an increase in the life-cycle costs associated with Site cleanup and closure.

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1 Final Rocky Flats Cleanup Agreement (RFCA), Federal Facility Agreement and Consent Order (CERCLA VIII-96-21, RCRA 3008[h] VIII-96-01, State of Colorado Docket 96-07-19-01), July 19, 1996.

2 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9620 *et seq*.

3 Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments Act (HSWA) and the Federal Facility Compliance Act (FFCAct), 42 USC 6901 *et seq*.

4 Colorado Hazardous Waste Act (CHWA), CRS 25-15-101 *et seq*.

5 The Rocky Flats Vision is contained in Appendix 9 of RFCA.

6 Rocky Flats Closure Project Management Plan, Rev. 4, October 6, 1999.

7 The terms "building" and "facility" are used interchangeably in this DOP.

8 Facility Assessment for the Industrial Area Reuse Study, December 8, 1997.

Table 1. Alternatives Analysis Summary

Alternative	Description	Effectiveness	Feasibility	Relative Cost
1-Decommissioning	Decommissioning activities will be performed in accordance with RFCA decision documents approved by DOE and CDPHE or EPA. Activities will include (as necessary) post-deactivation decontamination, component removal, size reduction, and demolition of building structures, as well as waste generation.	Decommissioning is effective in achieving the long-term goals of the Rocky Flats Vision. Buildings are decontaminated and demolished to three feet below the final proposed grade; underground structures are removed and/or stabilized; mortgage costs are eliminated; risks to workers and the environment are reduced.	Technology currently exists to achieve the objectives of this alternative, both technically and administratively. Integration with other Site activities (e.g., waste storage capacity) can be accomplished.	Decommissioning results in the lowest life-cycle costs. Once decommissioning is achieved, minimal landlord costs will be incurred.
2 – No action with safe shutdown maintenance (i.e., "mothballing")	RFETS buildings will be maintained in their current configuration. No additional equipment will be removed unless the present safe shutdown status of the buildings is compromised.	No action delays closure activities that must be performed to meet the long-term goals of the Rocky Flats Vision. This alternative is also effective in achieving the near-term goal identified in the RFCA preamble (Objective #7). Deferring decommissioning could make funding available for other removals. However, long-term goals may be jeopardized if the structural integrity of the mothballed facilities increases risk to workers and the environment.	Administratively, this alternative is not ideally implementable because the integrated Site-wide baseline is based on the decommissioning of all RFETS facilities. No Action could disrupt the long-term goals for RFETS.	The No action alternative has the life-cycle costs of decommissioning (adjusted for future value) plus the landlord/surveillance costs necessary to maintain a mothballed facilities (structural continuity, fire prevention, etc) until demolition.
3 – Reuse	A new mission will be assigned by the Site Facilities Use Committee. Utilities and equipment will be maintained in their current configuration until the new mission is defined. Depending on the nature of the new mission, some equipment may need to be removed.	Facility reuse was evaluated by the Site Facility Use Committee in accordance with DOE Order 430.1A, Disposal of Government-Owned Land Improvements. No future use was identified.	Because no new mission has been identified for RFETS facilities, and because the Site-wide integrated baseline is based on the decommissioning of all RFETS facilities in the near future, implementation of this alternative is neither feasible nor reasonably foreseeable at this time.	This alternative results in the greatest life-cycle costs. Facilities will require modification prior to reuse and landlord/surveillance costs will continue to be incurred. Once the new mission has expired, the facilities will still need to be decommissioned.

The alternatives were evaluated for potential impacts on the human environment (i.e., air, surface water, groundwater, soils, plants and animals, historic resources, and the socioeconomics of surrounding communities). Alternative 1 is the selected alternative because decommissioning supports the Rocky Flats Vision of safe, accelerated, cost-effective closure. This alternative also maintains long-term protection of public health and the environment. By removing RFETS facilities and associated contamination, risks posed by the Site will be reduced and/or eliminated.

1.2 Decommissioning Under the Rocky Flats Cleanup Agreement

The regulatory approach to decommissioning is presented in the RFETS Decommissioning Program Plan (DPP)[9]. The Facility Disposition Program Manual (FDPM)[10] establishes the RFETS internal requirements for planning and executing decommissioning activities, including preparation of a Project Management Plan (PMP)[11]. The PMP documents planning activities for the entirety of each RFETS closure project, including deactivation and decommissioning.

The decommissioning process begins with internal and external scoping meetings, at which the individual closure project points of contact from the Site and the lead regulatory agency (LRA) engage the RFCA consultative process to discuss the scope of the decommissioning project.[12] Reconnaissance level characterization (RLC) is then performed to identify radiological, chemical, and physical hazards. Results are summarized in the Reconnaissance Level Characterization Report (RLCR). The RLCR provides the basis for determining building types.

As described in the DPP, buildings are typed based on levels of contamination. Buildings classified as Type 1 are free of contamination; Type 2 buildings do not have significant contamination or hazards, but need some level of decontamination; and Type 3 buildings have significant contamination and/or hazards. Different RFCA decision documents may be used to decommission each type of building. The DPP serves as the RFCA decision document for Type 1 buildings, thus decommissioning activities may be performed using RFETS procedures upon notification of the LRA. Type 2 buildings require a separate RFCA decision document in the form of a Proposed Action Memorandum (PAM), Interim Measure/Interim Remedial Action (IM/IRA), or RFCA Standard Operating Protocol (RSOP), or they may be included with Type 3 buildings in an approved Decommissioning Operations Plan (DOP).

Additional characterization may be conducted during decommissioning as facility components are removed and building surfaces are exposed. This type of characterization is referred to as "in-process characterization." Data from in-process characterization is used to identify additional hazards; refine approaches to facility component removal, size reduction, decontamination, and demolition; revise waste volume estimates; and modify environmental safety and health (ES&H) controls, as necessary. In-process characterization is also conducted to determine the type and extent of decontamination, and to verify that the applicable decontamination goals and waste acceptance criteria (WAC) of treatment, storage, and disposal (TSD) facilities have been met. In addition, a pre-demolition survey is conducted prior to demolition to ensure that buildings have been sufficiently decontaminated to meet applicable performance specifications. Facility characterization activities are performed in accordance with the RFETS Decontamination and Decommissioning Characterization Protocol (DDCP)[13], which defines the

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9 RFETS Decommissioning Program Plan , (latest revision)

10 RFETS Facility Disposition Program Manual, MAN-076-FDPM, Revision 1 (September 24, 1999).

11 The Project Management Plan (PMP) will replace the Project Execution Plan (PEP) in the next revision to the FDPM.

12 The consultative process is described in Part 7 of RFCA (¶¶51-61) and in Section 1.1.1 of the DPP.

13 Rocky Flats Environmental Technology Site Decontamination and Decommissioning Characterization Protocol, MAN-077-DDCP (latest revision).

characterization process and provides guidance for establishing appropriate data quality objectives (DQOs) and assessing data quality.

Figure 1 summarizes the relationships between RFETS Closure Project documents and drivers, individual closure project characterizations, decision documents, and reports, including the use of four RSOPs: the RSOP for Recycling Concrete; the RSOP for Facility Component Removal, Size Reduction and Decontamination Activities; the RSOP for Facility Disposition; and the RSOP for ER Activities.[14] This figure shows the major closure activities, including preparation of key documents and interfaces between the three elements of Site closure (i.e., deactivation, decommissioning, and environmental restoration [ER]).

While the regulatory processes and documentation for decommissioning and ER are separate, these two major elements of facility closure interface at various points in the closure process and will sometimes occur concurrently in a building or building cluster. The Industrial Area Characterization and Remediation Strategy[15] describes the interfaces within the Industrial Area. Before, during, and after facility component removal, size reduction, and decontamination activities, ER subject matter experts (SMEs) will characterize underbuilding contamination (UBC) and surrounding soils, as appropriate. Characterization activities will be described in the Environmental Restoration Industrial Area Sampling and Analysis Plan. Integration of the decommissioning and environmental restoration elements of the Building 707 Closure Project will be described in the PMP.

1.3 Scope and Purpose

The purpose of this DOP is to describe the decommissioning process for the Type 2 and 3 buildings within the Building 707 Cluster. As discussed in the DPP, Building 707 has been identified as a Type 3 building. As determined by the RLC and reported in the RLCR for the Building 707 Cluster, there are seven Type 2 facilities, Buildings 708, 709, 718, 731, 732, 778, and one outdoor tank. The remaining facilities are Type 1 facilities and are therefore not included within the scope of this DOP.

The DOP is arranged in 11 sections. Project organization, roles and responsibilities, and interfaces with the regulators and other stakeholders are discussed in Section 2.0. The Building 707 Cluster, its operational history, and current status are described in Section 3.0. Applicable or relevant and appropriate requirements (ARARs) are presented in Section 4.0. The project approach, performance specifications, and measures employed to protect worker health and safety and the environment are described in Section 5.0, as are the special challenges associated with removal of Building 707's network of chainveyors, ventilation and filtration systems, and contaminated portions of the building shell. Waste management is discussed in Section 6.0, closure options for the Cluster's RCRA-regulated units are presented in Section 7.0, and anticipated environmental consequences are presented in Section 8.0. A current project schedule is provided in Section 9.0, records are discussed in Section 10.0, and the comment responsiveness summary is contained in Section 11.0.

[14] At this time, the RSOP for Recycling Concrete is the only approved RSOP. The remaining three RSOPs are in various stages of preparation. These RSOPs will not be invoked until they are approved by the LRA.

[15] Rocky Flats Environmental Technology Site Industrial Area Characterization and Remediation Strategy (latest revision).

Figure 1. Major Closure Activities & Associated Documents

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2.0 PROJECT ORGANIZATION

This section provides a brief description of the Building 707 Closure Project organization structure, functions, and interfaces as they pertain to facility management and decommissioning. This information is being supplied to identify reporting relationships and responsibilities. The organizational structure is not an enforceable part of the DOP, and DOE or its contractor may alter the structure without prior notification to or approval of the LRA. Significant organization changes (e.g., management-level changes) will be shared with the LRA as part of the RFCA consultative process.

2.1 Project Team Organization Structure

The Building 707 Closure Project will function under an integrated scope, schedule, and cost control system that identifies roles, responsibilities, and interfaces. The project organization is described below, and depicted in Figure 2.

- **Building 707 Closure Project Management** – Accountable for the safe planning, execution, and successful completion of the Building 707 Closure Project in accordance with applicable standards and requirements.
- **Engineering, Environment, Safety, Health & Quality (EESH&Q)** – Provides program, policy, and regulatory guidance to the Facility Management, Ash/Dry Residues Project, and Facility Disposition organizations; performs inspections; manages radiological operations; coordinates assessments; collects, tracks, and trends Closure Project EESH&Q metrics; and provides engineering services and planning support to the Closure Project team.
- **Administrative Services** – Provides support in the area of human relations and labor relations; assists the Closure Project Manager in resource allocation planning; manages the Building 707 Closure Project training program; administers the employee compensation program; prepares Closure Project occurrence reports; and provides miscellaneous project administrative support (e.g., document preparation, control, and maintenance).
- **Project Planning, Controls, Contracts, and Procurement** – Develops Closure Project schedules; identifies resource requirements; maintains the Building 707 Project Management Plan (PMP); manages the Closure Project change control process; monitors and reports Closure Project performance; manages work control, including plan of the day (POD) and plan of the week (POW); administers subcontracts and task orders; and purchases equipment and supplies required to support Closure Project activities.
- **Facility Management** – Operates and maintains the Building 707 Cluster to support Closure Project activities; ensures compliance with the Building 707 Basis for Interim Operations (BIO); maintains facility safety category systems (e.g., criticality, fire, ventilation); releases/authorizes work; conducts facility surveillances; maintains facility security; manages facility emergency preparedness; conducts RCRA inspections; and maintains RCRA compliance.
- **Ash/Dry Residues Project** – Sorts, sieves, size-reduces, blends, and repackages the Site's remaining inventory of plutonium-contaminated ash and dry residues to meet shipping and disposal requirements; destroys and repackages inorganic combustibles and classified shapes (i.e., "dry" residues) to meet interim safe storage criteria, and shipping and disposal requirements.

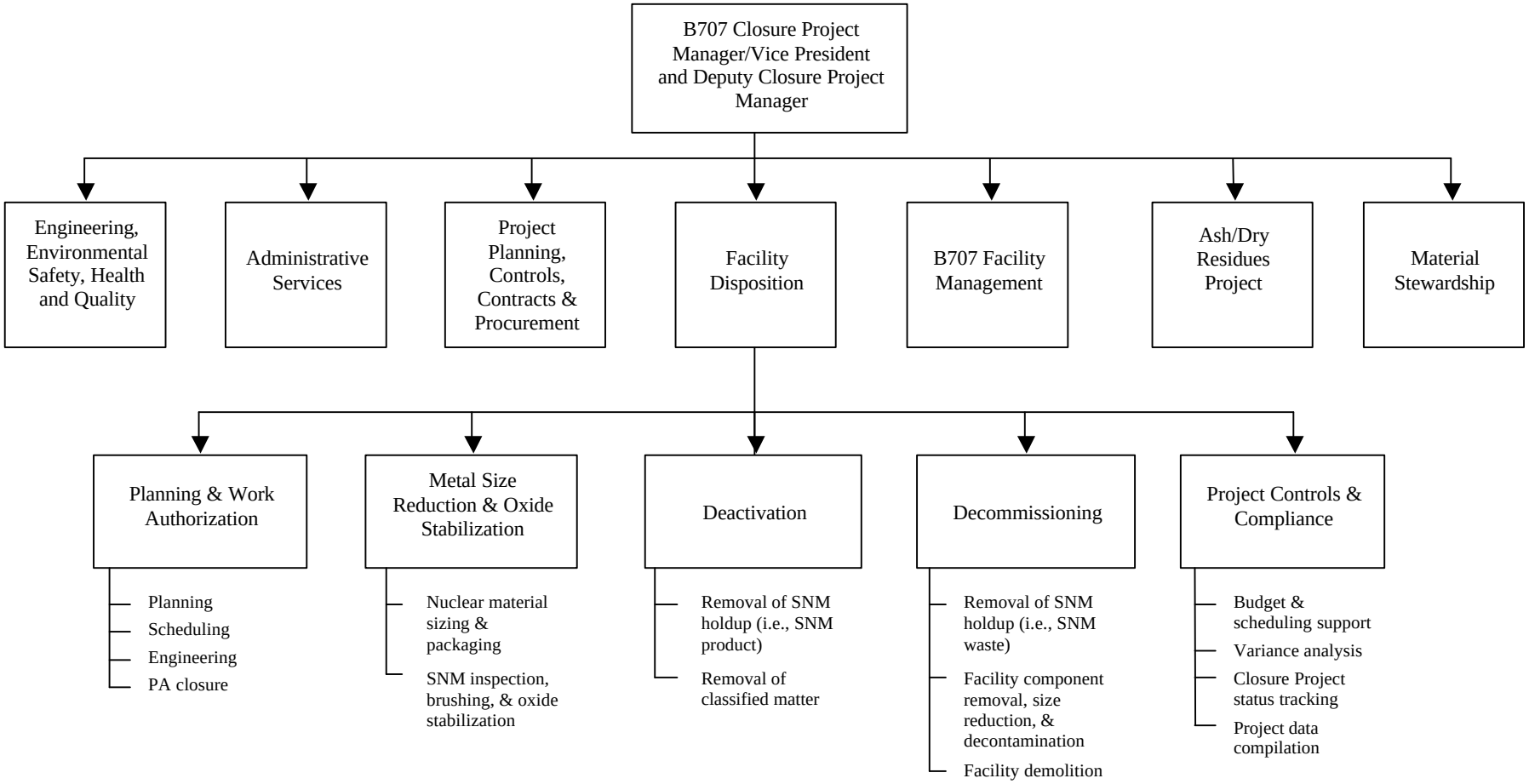

Figure 2. Building 707 Closure Project Organization

- **Facility Disposition** – Accountable for the planning and execution of metal sizing and oxide stabilization activities, deactivation activities, and decommissioning activities.
  - Planning and Work Authorization: Provides planning, start-up, and technical support for required activities. Functions include routine planning, scheduling, engineering, and operations support tasks (e.g., preparation of IWCP work packages, procedures, and property disposition); PA closure; deactivation scheduling and execution; decommissioning planning and execution; and demolition planning and execution.
  - Project Controls and Compliance: Provides budget and scheduling support, develops data necessary to support the RFETS 2006 Plan[16], performs variance analysis, and tracks Closure Project status.
  - Metal Size Reduction/Oxide Stabilization: Performs nuclear material sizing and preliminary packaging for off-Site transfer; conducts SNM inspection, brushing, and oxide stabilization activities, including feed material preparation for transfer to the Plutonium Stabilization and Packaging System (PuSPS) in Building 371.
  - Deactivation: Responsible for the removal of SNM holdup and "loose" materials, such as combustibles, furniture, and waste chemicals; preparation of gloveboxes for decommissioning; removal of organic liquids from equipment and systems; removal of classified material/tooling; and removal glovebox line- and non-line generated material.
  - Decommissioning: Responsible for the removal, size reduction, and decontamination of facility components and for facility demolition as described in this DOP.
- **Material Stewardship** – Provides commodities to support Closure Project needs; manages regulated wastes and coordinates inter-building material movements through facility disposition; provides nuclear material safeguards support (e.g., SNM inventory, assay, and accounting); and provides non-destructive assay services.

2.2 Project Team Interfaces

As owner of the Site, DOE oversees closure operations; provides input to the contractor regarding funding and overall direction; and communicates with the regulators and other stakeholders (e.g., the Citizens Advisory Board [CAB], the Rocky Flats Coalition of Local Governments [RFCLOG], and the public) regarding the status of the Building 707 Closure Project. In addition, DOE is responsible for the enforcement of health and safety provisions of certain federal regulations (e.g., Occupational Safety and Health Act [OSHA] requirements).

CDPHE is the LRA for the Industrial Area, and thus is the LRA for decommissioning activities conducted pursuant to RFCA. EPA is the support regulatory agency (SRA) in the Industrial Area. As a result, both CDPHE and EPA participate in oversight of decommissioning activities at RFETS. The Defense Nuclear Facilities Safety Board (DNFSB) oversees the storage of source, SNM, and byproduct material and radioactive wastes not subject to Nuclear Regulatory Commission (NRC) licensing and/or CDPHE/EPA regulation. CDPHE, EPA, and the DNFSB have executed a Memorandum of Understanding (MOU) with DOE to define their respective roles and responsibilities for oversight of activities conducted in the Industrial Area.[17]

[16] Rocky Flats Environmental Technology Site Closure Project Management Plan (latest revision).

[17] Memorandum of Understanding Governing Regulation and Oversight of Department of Energy Activities in the Rocky Flats Environmental Technology Site Industrial Area (IA), executed February 15, 1996.

2.3 Working Relationships

The personnel of DOE, its contractor and subcontractors, and the regulators (i.e., CDPHE, EPA) will use the RFCA consultative process[18] to establish and maintain effective working relationships with each other and with the general public throughout the decommissioning process. As described in the DPP, the principal aspects of the consultative process are as follows:

- **Timely Sharing of Information** – Information sharing efforts may include but need not be limited to: updates of the overall Site closure baseline, briefings on the development of work plans; briefings on changes to approved baselines, periodic project status briefings (e.g., "Pizza Meetings") and consultations on decommissioning strategy.
- **Collaborative Discussions of Program Changes** – The goal of these collaborative discussions is to raise and resolve issues without delaying decommissioning activities.
- **Designation and Use of Project Points of Contact for Information Exchange and Resolution of Issues** – The LRA and DOE will designate points of contact to facilitate open communication and resolution of issues. In addition, DOE will provide project point of contact designations for its contractor.
- **Respect for the Roles and Responsibilities of the Parties** – The LRA and DOE will have distinct roles and independent decision-making responsibilities. In general, the role of DOE is to oversee program and Closure Project planning, and to approve the CPB and baseline changes. The role of the LRA is to approve the DOP and other RFCA decision documents, oversee the planning and implementation of work, ensure protection of human health and the environment, and monitor compliance with RFCA and Closure Project ARARs.
- **Training** – To facilitate the consultative process, the LRA and DOE may develop and provide training to their respective staff and to the contractor, subcontractors, and interested members of the public.

Per RFCA, CDPHE is the lead regulatory agency (LRA) for decommissioning activities conducted in the Site's Industrial Area.[19] To expedite the decommissioning process, the parties have agreed the LRA may exercise authority by participating in the IWCP process. For the purposes of this DOP, this means the LRA has an opportunity to discuss issues and ask questions, but it does not mean the LRA has approval authority for IWCP work packages. DOE and its contractor will advise the LRA of IWCP meetings and roundtable review sessions, and will provide relevant information in a timely manner. The LRA, DOE, and the contractor or subcontractors may use these roundtable review sessions as a forum for RFCA consultation. If this process does not address the LRA's concerns, the LRA may issue a "stop work" order pursuant to RFCA.[20]

[18] The consultative process is described in ¶¶51-61 of RFCA, in Appendix 2 of RFCA, and in Section 1.1.1 of the DPP.

[19] See RFCA ¶70.

[20] See RFCA (¶¶176-180).

3.0 CLUSTER DESCRIPTION

The Building 707 Cluster is comprised of Building 707 (including the707A Annex) and various support facilities located within the Site's Industrial Area. Figure 3 shows the relative location of the Building 707 Cluster within the Industrial Area. A descriptive overview of the Cluster is provided below. Additional details are contained in the RLCR.

Building 707 (Type 3) is a two-story structure with a single-story addition located on the east side of the main building. The general layout of the building is depicted in Figure 4 and Figure 5. To the north is a free-standing two-story structure (707A Annex), which has a separate east wall, but is considered to be part of the main structure. The foundations for the building are cast-in-place concrete caissons and grade beams. The caissons are cast in holes drilled into bedrock and are connected by reinforced concrete tie beams. Structural framing is a pre-cast, pre-stressed concrete twin-tee roof and second floor, supported on pre-cast concrete beams, girders, and columns.

The first floor consists of a concrete slab on grade. To prevent the potential for the spread of fire and/or contamination from one room to another, the first floor is configured into a series of modules (Modules A through H, J, and K), separated by hallways. A network of chainveyors runs between the modules to provide for the transfer of materials between production areas within Building 707, and between Building 707 and Building 776/777.

The second floor is an open room containing ventilation fans, filter plenums, pumps, and tanks that support first-floor operations. The below-grade exterior surfaces of the columns, pre-cast panels, concrete walls, concrete block walls, and the top six inches of the exterior surfaces of the perimeter grade beams and footings are covered with coal-tar waterproofing pitch. A polyethylene vapor barrier is located under the floor slabs. Joints in the exterior pre-cast concrete panels are caulked with silicone sealant.

The basement is cast-in-place concrete, containing a variety tanks (referred to as "C-Pit tanks") that were used to collect and clean spent solvent and machine oil. Other below-ground features include a series of autoclaves used for the assembly of parts in a heated, high-pressure, helium atmosphere, and one elevator shaft.

The Site's supply of 138,000-volt electricity is stepped down for building use at seven transformers. Stepped-down voltages are distributed to motor control centers and emergency motor control centers on the second floor of the building. Four transformers supply 480 volts to equipment motor control centers, one supplies 480 volts to the emergency motor control centers and the uninterruptible power supply system, one supplies 2,400 volts to equipment on the second floor, and one supplies 480 volts to the lighting panel distribution system.

Plant air, instrument air, and breathing air are supplied to distribution points from air compressors located in Building 708. Nitrogen used to inert the production lines is piped to the building from the Nitrogen Plant (Building 223). In the event the Nitrogen Plant shuts down, a liquid nitrogen tank (T-223) located at the southeast corner of the building may be used to supply nitrogen to the building in an emergency. Argon is supplied from a liquid supply tank located at the southwest corner of Building 707. During production, carbon tetrachloride was supplied from an aboveground tank (T-206/D2) located on the north side of the building. Steam originating from the Steam Plant (Building 443) at 115 pounds per square inch (psi) is reduced to 30 psi at a pressure-reducing station located on the second floor. Tower water used to extract heat from the closed-loop cooling heat exchangers is supplied from Building 711. Ethylene glycol water (brine) coolant used to extract heat from the process chilled-water system is supplied by Building 708. Helium is supplied from a bank of tanks (T-209 to T221) located to the south of the building.

Figure 3. Building 707 Cluster

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Persons with access to Unclassified Controlled Nuclear Information (UCNI) may obtain this information from the Building 707 Closure Project Manager.

Figure 4. Building 707 First Floor Layout

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Persons with access to Uncontrolled Classified Nuclear Information (UCNI) may obtain this information from the Building 707 Closure Project Manager.

Figure 5. Building 707 Second Floor Layout

The heating, ventilation, and air conditioning (HVAC) systems provides the desired temperature, humidity, and air exchanges within the building and maintains confinement of radioactive material by means of pressure differential controls (i.e., air flows from areas of least contamination to areas of higher contamination) and exhaust air filtration. There are nine supply systems in the Building 707 production areas and a separate system for the offices and corridors in the north part of the single-story section of the building. Most of the air is re-circulated, with only about 20% fresh air introduced from the outside. Air entering the handling unit is drawn through medium-efficiency filters and is heated or cooled as it passes over chilled-water or hot-water coils.

The general dry air system provides continuous re-circulation of clean, conditioned, low-humidity air to most of the plutonium handling areas of the building. The general air dryer system consists of nine similar conditioning units complementing the modular arrangement of the building. Although the conditioning units are independent, they are grouped to share common supply and exhaust plenums. Each conditioning unit blends outside air and re-circulated air drawn from the second floor equipment room. Corridor air is exhausted through module exhaust drops to ensure the corridors have a positive pressure flow to the modules.

The glovebox dry air system supplies dry air to all gloveboxes and conveyor lines not requiring an inert atmosphere. This is a single-pass system that draws air from the second-floor equipment room, filters it through HEPA filters, and dehumidifies and re-heats it using steam and hot water coils before distributing it to the gloveboxes. The exhaust from the gloveboxes then passes through four stages of HEPA filtration before being exhausted to the atmosphere.

Two inert atmosphere systems service gloveboxes and chainveyors in Modules A, B, C, J, K and the storage vault (i.e., X-Y Retriever) in Module K. These systems maintain a dry, inert atmosphere of nitrogen containing between 1% and 5% oxygen by volume. The nitrogen for both systems is supplied to the building at 125 psi, reduced to 15 psi for general building use, and further reduced to 3 psi for individual systems. Each system exhausts some of the inert gas to the atmosphere. The inert systems consist of a chilling coil, re-heat coil, re-circulating fan, four-stage HEPA filter plenum, and exhaust fan. All ventilation systems, with the exception of the office system, have backup systems that may be operated during maintenance activities or in the event of an emergency.

Building 708 (Type 2) is a windowless, single-story, concrete structure with a concrete slab floor on grade and a neoprene Hypalon® roof. The building consists of a single open room, which houses the Building 707 emergency generator and the supplied breathing air system for the 700 Complex (i.e., Buildings 707, 771, 776/777). The Building 708 control room is located on the west side of the building and is constructed of steel studs and gypsum board. The building also houses the chillers that supply ethylene glycol water solution (brine) to the closed loop cooling systems in Building 707.

Building 709 (Type 2) is a cooling tower, which was constructed in 1969 to service Building 707 cooling water requirements. It has been out of service since 1988 or 1989. The cooling tower is a square wooden structure that sits within a concrete basin. The 35-foot tower has two cells, each with separate fan motors and gearboxes. The gearboxes are located directly beneath the fan blades and are below the top deck. The fans are located on the top deck and are surrounded by shrouds. The lower exterior portion, on the north and south sides, consist of 3 sheet-metal slats approximately three feet wide. Approximately 17 lamps surround the perimeter of the top of the tower and the access stairs to the top deck. The top deck of the cooling tower also houses the return water distribution manifolds and two security post positions. The west side of the structure contains a metal ladder to the platform. The pumps and a generator are located on a steel platform west of structure. In addition, electrical systems, a hoist system, and sheet-metal shed are located on west side of the tower.

Building 718 (Type 2) Building 718 is an auxiliary shed, containing the plenum deluge system for Building 711.

Building 731 (Type 2) is a plenum deluge/process waste pit constructed of reinforced concrete, with a reinforced concrete stairway leading to the below-ground portion of the structure. The pit contains two 1,650-gallon fiberglass collection tanks and associated ancillary equipment. Waste collected in the tanks (e.g., chiller condensate, emergency eye wash/shower wastewater, decontamination water, and plenum deluge water) is transferred to Building 374 for treatment.

Building 732 (Type 2) is the former laundry pumping vault. The concrete structure contains one 800-gallon storage tank and ancillary equipment, which were used to filter wash water from the Building 778 laundry prior to transfer to Building 374 for treatment. Upon closure of the laundry facility in the early to mid 1990s, the tank system was tied into the Building 776/777 plenum deluge system.

Building 778 (Type 2) is a metal, Butler®-type building, located between Building 707 and Building 776/777. This building provides all-weather access to Buildings 707 and 776/777 through two enclosed corridors. In addition, it contains a portion of the chainveyor that was used to transport material between production areas in Buildings 707 and 776/777. The building houses the maintenance shops and the locker/shower facilities for those buildings. A laundry facility was added to the building when plutonium laundry operations were consolidated on Site. The walls are insulated with fiberglass batting and covered with gypsum board. The office ceilings are drop-in acoustical tile and the locker/shower room ceilings are gypsum board. Ceilings in the shops and the laundry are open to the insulation in the roof of the building. Initially, the east half of the building was the men's locker room and offices, while the west half contained the maintenance shops and the laundry. In the late 1970s or early 1980s, the locker/shower rooms were expanded to allow for the construction of a women's locker/shower room at the northwest corner of the men's locker room. In the late 1980s, an addition was added to the north side, adjacent to the laundry, to house a filter plenum for the air exhausting from the dryers.

Trailer 707S (Type 1) was used to store machining oil, cutting fluid, lubrication oils, greases, and used oils, which were blended for other uses. Presently the shed is used for equipment storage. The building is constructed of metal panels, a metal roof, and wooden floor.

Buildings 711 and 711A (Type 1) supply tower water to the cooling systems in Buildings 707, 708, and 750. Building 711 is the cooling tower and Building 711A houses an emergency diesel pump for the cooling tower.

Underground Storage Tank System (Type 1) Tank T-290 is a diesel fuel tank system, which was emptied, foamed, and closed in place in 1996.

Aboveground Storage Tank Systems (Type 2 and Type 1) supporting Building 707 operations are located outside the facility. These tanks include: carbon tetrachloride Tank T206/D2; liquid argon Tank 208; helium Tanks T209-T221; liquid nitrogen Tank T-223; and diesel fuel Tanks T-324, T-325, TK-11 and TK-16.

3.1 Building History

Facilities within the Building 707 Cluster were designed and constructed in the early 1970s to replace the manufacturing processes originally performed in Building 776/777. Operations were divided into eight categories: casting, forming, metallurgy, machining, assembly, inspection, and non-destructive testing of plutonium parts, and associated support services. Plutonium metal feed was cast into ingots of the required shapes, which then proceeded through standard metalworking steps to become finished weapons parts. Finished plutonium parts and parts made of other materials, such as uranium, beryllium, and stainless steel, were assembled into subassemblies, which were joined to become final assemblies. Parts were inspected and tested at various points throughout the production process.

Prior to the change in mission, the production process began in Modules A, J, and K, where feed material was stored in preparation for casting into various shapes. Module B housed metallurgical operations, which were performed to roll, heat treat, and shape plutonium parts, which were then sent to machining operations. After shaping, excess metal was cut off and sent to Module C to be briquetted.

Module C was used to machine plutonium parts to the required dimensions. Turnings and chips from machining operations in Module C and trimmings from forming operations in Module B were degreased and sent to the briquetting press to be made into pucks, which were returned to the casting furnaces to be re-cast into feed ingots. In Module D, serial numbers were affixed to finished parts, which were cleaned with solvents, weighed, and inspected.

Plutonium pits were assembled in Module E, beginning with the welding of matched hemi-shells with electron beam welders. The pits were then inspected using any of a number of inspection disciplines, including radiography x-ray, weld scanners, eddy current testing for weld penetration, and fluorescent dye penetration for cracks and voids. The subassemblies were then washed and sent to Module F for final assembly.

Module F, known as the "super dry room" because of the precisely controlled humidity, temperature, and airflow, was the final assembly point where the plutonium, uranium, and covering parts were put together. The covering parts, such as beryllium and stainless steel, were welded shut. The completed assembly was then pumped down on a heated table to check for leaks and to remove moisture and other contaminants. Module F also contains a mass spectrometry laboratory that was used to analyze gases in the assembled pits.

During production, several operations were carried out in Module G, including brazing of plutonium parts encased in other non-radioactive metals; brazing of non-radioactive subassemblies; cleaning of aluminum, stainless steel, uranium, and beryllium parts; inspection of these subassemblies; and, if needed, disassembly of rejected units. Module H was a high-pressure assembly area for plutonium, vanadium, beryllium, titanium, and uranium parts. High-pressure assembly was accomplished in an autoclave under a heated, high-pressure helium atmosphere. Beryllium parts were baked in vacuum furnaces to remove moisture.

3.2 Current Status

With suspension of nuclear production operations at Rocky Flats in 1989, and the subsequent discontinuation of the production mission in 1991, activities conducted in the Building 707 Cluster have been re-directed to support Site closure, including:

- Completion of mission risk reduction activities, such as residue stabilization and oxide stabilization; and
- Completion of deactivation activities in preparation for decommissioning, including removal of SNM and classified matter; shipment of metal components, declassification of classified molds and/or tools by shape alteration; and removal of loose equipment, combustibles, chemicals, and organic liquids.

In addition, landlord activities are performed, as necessary, to support day-to-day operations and to ensure compliance with the Building 707 Basis for Interim Operation (BIO)[21] and other Site requirements, including general housekeeping, routine waste management, maintenance of safety category systems, laboratory services, records management, inspections, and surveillances. The Building 707 BIO provides detailed descriptions of facility activities.

[21] Building 707 Facility Complex Basis for Interim Operation (BIO), latest revision.

3.3 Expected Condition of Type 3 and Type 2 Buildings at the Beginning of Decommissioning

The Type 3 and Type 2 buildings within the Building 707 Cluster will be decommissioned using a graded approach. As mission activities are completed in each area, deactivation activities will be undertaken to prepare for decommissioning in accordance with this DOP. The schedule of decommissioning activities is included as Appendix D to this DOP. Details concerning the condition of the buildings within the Cluster are provided in Section 5.3.

4.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Decommissioning activities conducted at RFETS must comply with the applicable or relevant and appropriate requirements (ARARs) under the Comprehensive Response Compensation and Liability Act (CERCLA). ARARs have been identified for the complete scope of decommissioning activities, including demolition, and they are listed in Appendix A.

Pursuant to RFCA, actions taken under an approved RFCA decision document are exempted from the procedural requirement to obtain federal, state, or local permits. For activities performed within the scope of this DOP, certain hazardous and mixed waste management activities are exempted from permitting requirements of RCRA and CHWA, as discussed in Sections 5.0 and 6.0. The following paragraphs describe how the ARARs will be applied to decommissioning activities in the Building 707 Cluster to satisfy the RFCA permit waiver requirements.

4.1 Air

Closure activities have the potential to generate particulate, radionuclide, fugitive dust, and hazardous air pollutant emissions. Subpart H of 40 CFR 61 contains the requirements for monitoring and reporting activities within DOE facilities that have the potential to emit radionuclides other than radon. Building 707 is subject to effluent monitoring of radionuclides due to holdup in ducts and gloveboxes.

Colorado Regulation No. 1 (5 CCR 1001-3) governs opacity and particulate emissions. Section II of Regulation No. 1 addresses opacity and prohibits stack emissions from fuel-fired equipment exceeding 20% opacity. Section III addresses the control of particulate emissions. Fugitive particulate emissions will be generated from demolition and transportation activities. During demolition activities, dust minimization techniques, such as water sprays, will be used to minimize suspension of particulates. In addition, demolition operations will not be conducted during periods of high wind.[22] The substantive requirements of Regulation No. 1 will be incorporated into a Dust Control Plan, which will define the level of air monitoring and particulate control for the project.

Colorado Regulation No. 3 (5 CCR 1001-3) provides CDPHE with the authority to inventory emissions and Part A describes Air Pollutant Emission Notice (APEN) requirements. If applicable, an Air Pollutant Emission Notice (APEN) will be prepared by air quality management subject matter experts (SMEs) to facilitate CDPHE's inventory process.

4.2 Solid Waste

During decommissioning, hazardous and mixed wastes designated as "process" waste (i.e., mixed residues; liquids, sludges, and oils in tanks and ancillary equipment; containerized waste generated prior to approval of this DOP, and liquid waste chemicals, no matter when generated) will be managed in accordance with the substantive and administrative requirements of RCRA, CHWA, the Colorado Hazardous Waste Regulations (CHWR), and the Site's RCRA Part B Permit. Hazardous and mixed wastes designated as "remediation" waste will be managed in accordance with the substantive requirements of the applicable regulations (i.e., the waste management ARARs).

Non-radioactive, non-hazardous wastes will be managed in compliance with the substantive requirements of CDPHE's solid waste regulations (6 CCR 1007-2). If necessary, remediation waste may be treated in

[22] At RFETS, the high wind threshold is typically 30 mph (sustained), as prescribed by the Shift Superintendent.

remediation waste treatment units established under the substantive requirements of 6 CCR 1007-3, Part 264.553. Incompatible waste, if encountered, will be segregated within the units. The need for secondary containment will be assessed and provided, as appropriate, when liquid waste is stored or treated in tanks or containers. Wastes will be characterized, as appropriate, in accordance with the substantive requirements of 6 CCR 1007-3, Part 261. Once tanks have been drained, berms providing secondary containment will be removed to facilitate equipment removal.

Asbestos containing material (ACM) will be managed in accordance with 5 CCR 1001-10, Regulation 8. Specifically, Section III, C.7.6, provides maximum allowable asbestos levels and Sections C.8.2(b), (d) and (f) provide requirements for handling asbestos waste materials.

Polychlorinated biphenyls (PCBs), including those that are radiologically contaminated, will be managed in accordance with the substantive requirements of 40 CFR Part 761.

4.3 Wastewater

Remediation wastewater will be managed consistent with provisions of the RFCA Implementation Guidance Document (IGD).[23] Remediation wastewater will be collected, characterized, and transferred to an approved treatment unit for processing (e.g., Building 374, the Site sewage treatment plant, or to another approved on-Site or off-Site treatment facility), or it will be directly discharged in accordance with the Site requirements for control and disposition of incidental waters. In addition, all connections to the sanitary sewer system will be identified and protected pursuant to 40 CFR 125, and all discharges of stormwater and treated wastewater into surface water bodies will meet the applicable substantive requirements.

4.4 Migratory Birds

Closure activities may impact migratory birds protected by the Migratory Bird Treaty Act[24], and the Fish and Wildlife Conservation Act.[25] Due to the variations in potential impacts depending upon the season and the nesting schedules for migratory birds, the substantive requirements of these federal statutes will be evaluated by ecology SMEs prior to conducting the actions associated with decommissioning. The substantive requirements identified during the evaluation will be implemented throughout decommissioning.

[23] RFCA Implementation Guidance Document (Appendix 3 to RFCA), (latest revision).

[24] Migratory Bird Treaty Act, 16 USC 701 *et seq*.

[25] Fish and Wildlife Conservation Act, 16 USC 661 *et seq*.

5.0 PROJECT APPROACH

The decommissioning planning process for the Building 707 Cluster has been completed and the costs and schedules are included in the RFETS Closure Project Baseline (CPB). During the course of the Building 707 Closure Project, there may be instances where circumstances differ from those predicted. In such cases, planned activities may be revised without revising the CPB. Significant changes will be shared with the LRA as part of the RFCA consultative process and, where required, the appropriate modifications will be made to this DOP in accordance with RFCA.

5.1 Work Planning and Execution

Decommissioning activities will be planned and executed in accordance with the RFETS integrated safety management system (ISMS), which provides the framework for mitigating adverse impacts to workers, the public, and the environment. The ISMS is structured around five core principles:

- Define the work scope,
- Identify and analyze the hazards,
- Identify and implement controls,
- Perform the work, and
- Provide feedback.

As described in the following paragraphs, ISMS is implemented through a variety of existing Site-wide programs. The corresponding implementing documents are listed in Table 2.

5.1.1 Integrated Work Control Program

The Integrated Work Control Program (IWCP) Manual defines the method by which the ISMS is implemented at the activity level.[26] All work, except emergency work, is reviewed through the IWCP screening process. If the work involves corrective maintenance, a work control form (WCF) is initiated first. Otherwise an activity screening form (ASF) is generated directly. The ASF is used to identify the types of hazards associated with the work activity and to select the required level of planning. Three options are available for planning work within the scope of this DOP:

- A low planning level approach is used when activity hazards and complexity are low, the applicable regulatory requirements and potential environmental impacts are minimal, the work is either routine or simple, and there is some experience at performing most, if not all, of the work.
- A medium planning level work control process is used when significant hazards are associated with the activity (or there is uncertainty about the hazards), the applicable regulatory requirements and potential environmental impacts are moderate, and the activity is somewhat complex or it has not been performed by the project team in the past.
- A high planning level work control process is used when there are significant hazards associated with the activity (or there is significant uncertainty about the hazards), the applicable regulatory requirements or potential environmental impacts are significant, and there is either significant complexity or the activity has not been performed by the project team in the past.

[26] The Site IWCP Manual (MAN-071-IWCP) is currently undergoing a major revision to streamline the planning process. Once approved, this revision will be used to plan decommissioning activities within the Building 707 Cluster without modifying this DOP.

Table 2. RFETS Integrated Safety Management System Programs and Associated Implementing Documents

ISMS Program	Implementing Document(s)	Document #(s)
Integrated Work Control Program	Site Integrated Work Control Program Manual	MAN-071-IWCP
Readiness Determination Program	Site Readiness Determination Manual	MAN-040-RDM
Conduct of Operations Program	Site Conduct of Operations Manual	MAN-066-COOP
Nuclear Safety Program	Nuclear Safety Program Unreviewed Safety Question Process	PRO-664-NSP-USQP
	Evaluation of Unreviewed Safety Questions	3-J69-NSPM-5C-01
Criticality Safety Program	Site Nuclear Criticality Safety Manual	MAN-088-NSM
Radiation Protection Program	Site Radiological Control Manual	MAN-102-SRCM
	Site Radiological Safety Practices Manual	RSP-01 to RSP-18
Occupational Safety & Industrial Hygiene Program	Occupational Safety & Industrial Hygiene Program Manual	MAN-072-OS&IHPM
Transportation Program	Site Transportation Manual (latest revision)	RF-TSM
	Off-Site Transportation Manual (latest revision)	1-T-95-TRAFFIC-120
Emergency Preparedness Program	Site Emergency Plan	EPLAN-96
Integrated Environmental Management Program	Site Integrated Environmental Management Program Manual (latest revision)	MAN-080-IEMM-IEMP
Quality Assurance Program		
1. Quality Assurance Programs	Site Quality Assurance Manual	N/A
2. Personnel Training and Qualification	Training Program Manual	MAN-094-TPM
3. Quality Improvement	Site Corrective Action Requirements Manual	1-MAN-012-SCARM
4. Documents and Records	Site Documents Requirements Manual	1-MAN-001-SDRM
5. Work Processes	Integrated Work Control Program, Readiness Determination Manual, Conduct of Operations Manual, Nuclear Safety Manual, Nuclear Criticality Safety Manual, Radiological Control Manual, Site Occupational Safety & Industrial Health Program Manual	MAN-071-IWCP, MAN-040-RDM, MAN-066-COOP, PRO-664-NSP-USQP, MAN-088-NSM, MAN-102-SRCM MAN-072-OS&IHPM
6. Design	Site Engineering Requirements Manual	MAN-027-SERM
7. Procurement	Acquisition Procedure for Requisitioning Commodities	1-W36-APR-111
	Services Identification and Control of Items	1-A67-QAP-08.01
8. Inspection and Acceptance Testing	Inspection and Acceptance Test Process	1-PRO-072-001
9. Management Assessments	Site Integrated Oversight Manual	1-MAN-013-SIOM
10. Independent Assessments	Site Integrated Oversight Manual	1-MAN-013-SIOM

Once the required level of planning has been identified, the planning team performs a job walkdown and uses the results of the ASF to complete a Job Hazard Identification Tool (JHIT) checklist. The JHIT directs the planning team to:

- Focus on the hazards associated with the proposed activity,
- Identify potential environmental regulatory compliance issues and contact the environmental SMEs who must participate in the planning process (e.g., air quality, water quality, hazardous and mixed waste),
- Evaluate the potential consequences, and
- Establish the appropriate standards-based hazard controls.

As depicted in Figure 6, this is an iterative process that is repeated until all controls are identified, then revisited when new hazards are discovered or the scope of work changes. Results are documented in the Job Hazards Analysis (JHA). A more detailed Integrated Hazard Analysis (IHA) is conducted for highly complex and/or hazardous activities. Upon completion of the JHA/IHA work control documents, such as activity-specific procedures or IWCP work packages, are prepared and reviewed by Site program SMEs (e.g., radiological engineering, environmental). As discussed in Section 2.3 of this DOP, the LRA has a standing invitation to all IWCP planning meetings and associated roundtable review sessions.

5.1.2 Readiness Determination Program

Readiness determination SMEs will review individual projects and activities to establish the need for an Operational Readiness Review (ORR) or Readiness Assessment (RA) in accordance with the Site Readiness Determination Manual (RDM). The RDM applies to the startup and restart of nuclear, non-nuclear, radiological, environmental restoration, waste management, deactivation, and/or decommissioning activities that are new, complex, or require activity-specific changes to a facility's authorization basis (AB). For the Building 707 Closure Project, it is anticipated readiness determinations will be performed for initial component removal activities; size reduction of gloveboxes, tanks, chainveyors and similar equipment; and building demolition, although some of these reviews may be combined, depending on the schedule of activities. As discussed in Section 2.3 of this DOP, the LRA has a standing invitation to all readiness reviews performed for work conducted within the scope of this DOP.

5.1.3 Conduct of Operations Program

The conduct of operations (COOP) program provides a formal, disciplined approach to facility operations. Key elements of the program include the following:

- Work must be performed by appropriately trained personnel using adequate and controlled procedures,
- Work must be properly supervised, and
- Work must be authorized by the Configuration Control Authority (CCA).

The COOP program also provides processes for monitoring facility operations through functions such as logkeeping, conduct of rounds, internal surveillances, and requirements for planning and releasing work.

Facility managers use the Plan of the Week (POW) and Plan of the Day (POD) to schedule, authorize, and control activities in an RFETS facility, and provide a forum for discussing planned activities and resolving scheduling conflicts. Once the POW and POD have been established and approved by facility management, a meeting is held early in the shift to release work for the day. The Shift Manager or CCA chairs this meeting, during which he or she explains terminations in the facility, identifies radiological

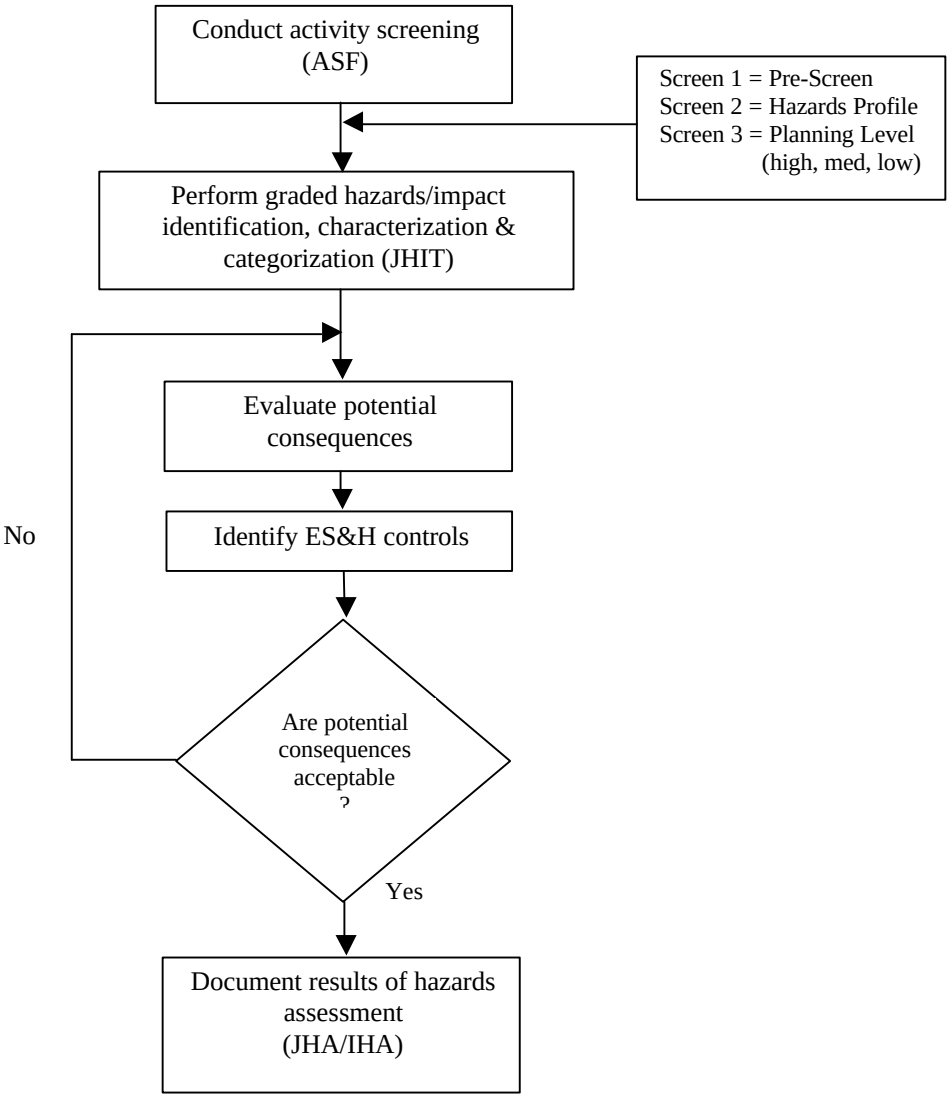

Figure 6. Integrated Work Control Program Hazards Identification & Assessment Process

areas, and ensures work will be performed by qualified personnel (i.e., personnel appearing on the list of qualified individuals (LOQI) for the facility). Pre-evolution briefings (PEBs) are conducted to ensure that project personnel understand the applicable hazards and controls, and are adequately prepared to perform the scheduled activities. The PEB provides a mechanism for implementing the ISMS at the floor level. As discussed in Section 2.3 of this DOP, the LRA has a standing invitation to POWs, PODs, and PEBs.

5.1.4 Nuclear Safety Program

Nuclear safety SMEs will review procedures and work packages to ensure planned activities may be performed within the facility's existing AB, and the established radiological controls are adequate to protect the worker, the public, and the environment. The safety evaluation screen (SES) identifies activities that may be outside the AB and therefore may present an Unreviewed Safety Question (USQ). A USQ Determination (USQD) is performed to evaluate activities with the potential to challenge the limits of a facility's AB. It is a more in-depth review of the activity than is the SES. Activities determined to be USQs must be approved by DOE before the work may proceed. If it is determined that additional facility safety controls are required to manage the hazards associated with the activity, they are documented in a Justification for Continued Operation (JCO), which is also approved by DOE before the work may be initiated. USQDs are prepared in accordance with the Nuclear Safety Program Unreviewed Safety Question Process.

5.1.5 Criticality Safety Program

The criticality safety program establishes controls for activities involving fissionable material. This program includes developing engineered and/or administrative criticality safety controls, monitoring compliance status with established controls that include occurrence investigation and reporting, and maintaining and controlling distribution of technical documents. The program ensures the criticality safety program organization approves criticality safety controls either through new evaluations or through the criticality safety limit examination program for all activities involving the storage, relocation, and/or processing of fissionable material. The criticality safety program is implemented in accordance with the DOE-approved Site Nuclear Criticality Safety Manual.

5.1.6 Radiation Protection Program

The radiation protection program implements standards, limits, and program requirements for protecting workers from exposure to radioactive materials. The program is based on the principle of ALARA (i.e., as low as reasonably achievable) and provides for personnel dosimetry, surveillance and maintenance of engineered radiation protection systems, issuance of radiological work permits (RWPs), and area surveillance and posting. Radiological protection for planned activities is ensured through reviews of work control documents, pre-job surveys, and the use of personal protective equipment (PPE). Personnel exposures are formally tracked, recorded, and reported to each individual. Radiological monitoring is performed in accordance with the DOE-approved Radiological Control Manual and Radiological Safety Practices Manual.

5.1.7 Occupational Safety & Industrial Hygiene Program

The occupational safety & industrial hygiene (OS&IH) program ensures personnel exposures to physical, chemical, and biological hazards in the work environment are controlled by requiring job supervisors and OS&IH personnel to identify OS&IH hazards in the work area. Program safety and technical reviews are integrated into the IWCP process to ensure non-radiological OS&IH hazards (i.e., physical, chemical, biological) are identified and appropriate measures are instituted to protect the worker (e.g., engineered systems, PPE, monitoring equipment). The IH&S program follows the standards defined in 29 CFR Part 1910 and the DOE-approved Site Occupational Safety & Industrial Hygiene Program Manual.

5.1.8 Transportation Program

The Site transportation program specifies safe and compliant packaging requirements for both on-Site and off-Site transportation of radioactive and hazardous materials to prevent releases and minimize accident consequences. The transportation program describes a process for incorporating packaging and labeling requirements into work control documents and defines training requirements for personnel involved in the packaging and shipment of hazardous materials. The RFETS transportation program is implemented through the DOE-approved Site Transportation Manual and the Off-Site Transportation Manual.

5.1.9 Emergency Preparedness Program

The emergency preparedness program provides the plans, procedures, and resources necessary to respond to Site emergencies. The program is based on a comprehensive understanding of the potential hazards and potential radioactive material and hazardous chemical release mechanisms present in the facility. The program includes management planning; designation of an emergency response organization; training; and drills (Site-wide and building-specific) for possible abnormal events including fires, hazardous material spills, inadvertent criticalities, and personnel accountability during facility evacuation. The program's trained emergency response personnel ensure worker and public safety during an abnormal event. Emergency preparedness program elements also include timely notifications of the emergency preparedness organization. The emergency preparedness program is implemented through the DOE-approved Site Emergency Plan, as augmented by building-specific emergency response operations procedures.

5.1.10 Integrated Environmental Management Program

Decommissioning activities will also be screened by integrated environmental management program SMEs, who use the RFETS Environmental Checklist to identify activities that may impact any of the Site's environmental programs. Each program is described in a media-specific program plan, which is contained in the Site's Environmental Management Program Manual. Each program plan defines the program elements, assumptions, and strategies; describes the regulatory drivers and requirements; and identifies the contractor-approved controlling documents and Site-wide systems governing each program. Following are examples of the Site's media-specific environmental programs:

- RFCA program,
- NEPA program,
- RCRA program,
- Air quality management program,
- Site water management program,
- Chemical life cycle management program,
- Toxic Substances Control Act (TSCA)/polychlorinated biphenyl (PCB) program,
- Safe Drinking Water Act program,
- Sanitary waste disposal program,
- Underground/aboveground storage tank program, and the
- Natural resource compliance and protection program.

5.1.11 Quality Assurance Program

All work performed within the scope of this DOP will be accomplished in accordance with the requirements of 10 CFR 830.120, Quality Assurance Requirements (the QA rule), the American National Standards Institute/American Society for Quality Control (ANSI/ASQC-E4), and the relevant DOE Order for Quality Assurance. The substantive requirements of the federal regulation, DOE Order, and ANSI/ASQC-E4 are implemented through the DOE-approved Site Quality Assurance Manual (SQAM). Table 2 includes a summary of the 10 quality criteria and lists the applicable implementing documents. Future changes to this list of documents will be shared with the LRA as part of the RFCA consultative process.[27]

5.2 Building 707 Cluster Characterization

The Building 707 Cluster is being characterized using a three-step approach: (1) scoping characterization, (2) reconnaissance level characterization (RLC), and (3) in-process characterization. The following paragraphs describe each step in more detail.

5.2.1 Scoping Characterization

During scoping characterization, existing records and documents were collected, and present and former Building 707 employees were interviewed to determine the radiological, chemical, and physical conditions of the Cluster. Based on the information collected, the B707 Closure Project team proceeded to conduct the RLC in accordance with the requirements of the RFETS Reconnaissance Level Characterization Plan (RLCP).

5.2.2 Reconnaissance Level Characterization

The purpose of RLC is to provide an initial assessment of the contamination, hazards, and other conditions associated with a facility. The RLC for the Building 707 Cluster was performed from December 1999 through May 2000. Results are documented in the Reconnaissance Level Characterization Report (RLCR) for the Building 707 Cluster and summarized in Table 3. Hazards were assessed based on a review of historical records, process knowledge, and survey measurements and analytical data collected from physical samples of various media (e.g., paint, cement) during the course of the RLC.

Radiological contamination was found within Buildings 707, 708, 709, 718, 731, 732, and 778. Contamination is present on building surfaces (e.g., floors, walls, ceiling, roof) and in equipment and building systems (e.g., gloveboxes and ventilation ducts). Some equipment and systems and areas within Building 707 have levels of radiological contamination exceeding 2,000 disintegrations per minute (dpm)/cm^2 removable; and 50,000 dpm/100 cm^2 fixed plus removable.

Beryllium contamination is present in Modules F and G of Building 707, and in many of the Building 707 gloveboxes, plenums, piping, and other equipment (e.g., the autoclaves and bake-out ovens in Module H, and gloveboxes and other equipment containing liquids in Modules A, B, C, E, H, J and K). Asbestos-containing material (ACM) is present in most of the 707 Cluster buildings in the form of floor and ceiling tile, other building material, and insulation. The Kathabar® dehumidification systems located on the second floor of Building 707 are contaminated with heavy metals, including lead and chromium.

[27] As part of the ongoing Technical Infrastructure Alignment Initiative, the contractor is reviewing, revising, combining, and/or re-writing 15 of the Site's high-level planning documents, including quality documents. As a result, document names and numbers are subject to change.

Table 3. Summary of Results from the Building 707 Reconnaissance Level Characterization Report

Building/ Facility	Chemical Contamination Indicated?	Type of Chemical Contamination	Location	Radiological Contamination Indicated?[4]	Type of Radiological Contamination	Location	Building Classification[1]
B707	Yes	Asbestos[5] Metals Beryllium Organic solvents	Multiple; including tiles & insulation Inside the Kathabar® dehumidification systems Modules F & G; also in gloveboxes, other equipment, piping, and plenums Residues in building systems (e.g., tanks and ancillary equipment)	Yes	Fixed alpha with some removeable	Extensive; on interior building surfaces, on and in equipment and systems, and on roof/exterior walls	Type 3
B708	Yes	Asbestos[5]	Ceiling tile, floor tile, and insulation	Yes[3]	Fixed alpha	Roof	Type 2
B709	Yes	Asbestos[5]	Thermal systems insulation piping adjacent to B799	Yes	U233/234, U235, U238	Sediment in sump	Type 2
B718	Yes	Asbestos[5]	Piping insulation	Yes	Fixed alpha	Roof	Type 2
B731	No	N/A[2]	N/A[2]	Yes	Fixed alpha and removable	Interior and roof surfaces; on/in equipment & systems	Type 2
B732	Unknown; not inspected; airborne radioactivity area	Unknown	Unknown	Yes	Fixed alpha and removable	Interior and roof surfaces; on/in equipment & systems	Type 2
B778	Yes	Asbestos[5]	Multiple; including tiles & insulation	Yes	Fixed alpha	Minimal; on floors, equipment, and roof	Type 2
Aboveground Tank T-206/D-2	Yes	Carbon tetrachloride	Inside tank	No	N/A[2]	N/A[2]	Type 2
Trailer T707S	Yes	Asbestos[5]	Building materials	No	N/A[2]	N/A[2]	Type 1

Building/ Facility	Chemical Contamination Indicated?	Type of Chemical Contamination	Location	Radiological Contamination Indicated?[4]	Type of Radiological Contamination	Location	Building Classification[1]
B711 & B711A	Yes	Asbestos[5]	Piping insulation	No	N/A[2]	N/A[2]	Type 1
Aboveground Tanks T-208, T-209 to T-221, T-223, T-324, T325, TK-16, & T-284	No	N/A[2]	N/A[2]	No	N/A[2]	N/A[2]	Type 1
Underground Tank T-290	No	N/A[2]	N/A[2]	No	N/A[2]	N/A[2]	Type 1

1 Per the DPP, Type 3 facilities have significant contamination and/or hazards; Type 2 facilities do not have significant contamination or hazards, but are in need of decontamination; and Type 1 facilities are free of contamination. Building classification does not include environmental media or bulk media beneath the immediate surface of the floors.

2 N/A = not applicable.

3 Contamination type to be confirmed; activity may be from naturally occurring radioactive material (i.e., not DOE-added material).

4 Radiological Engineering recommends surveys where significant configuration changes are implemented in the building prior to demolition due to unknowns associated w/ movement of bulk material or equipment.

5 The presence of asbestos does not make a facility a Type 2 as long as the asbestos is removed pursuant to the Site's asbestos abatement procedures.

Potential physical hazards within the Building 707 Cluster consist of those common to standard industrial environments, including hazards related to energized systems, utilities, gas cylinders, trips and falls, and forklift operations. The buildings have been relatively well maintained and are in good physical condition. As a result, there are no unique physical hazards associated with any of the buildings within the 707 Cluster.

5.2.3 In-Process Characterization

Additional characterization will be conducted during decommissioning, as facility components are removed and building surfaces are further exposed. This type of characterization is referred to as in-process characterization. Data from in-process characterization is used to identify additional hazards; refine approaches to component removal, size reduction, and decontamination; revise waste volume estimates; and modify ES&H controls, as necessary. In-process characterization is also conducted to verify that decontamination activities have achieved the applicable performance specifications, such as release or reuse criteria and waste acceptance criteria (WAC). In addition, pre-demolition surveys will be conducted prior to demolition to ensure the facilities have been decontaminated to meet applicable decontamination criteria. Detailed information regarding the characterization process and associated requirements is contained in the RFETS Decontamination and Decommissioning Characterization Protocol (DDCP).[28]

5.3 SET Identification and Prioritization

For planning purposes, the Building 707 Cluster has been divided into 17 SETs, which are small, manageable groupings of similar systems, equipment, and areas or rooms that can be worked independently. SETs serve as the foundation for scheduling decommissioning work within the Cluster. Typically, SETs are scheduled for decommissioning based on a series of factors, including safety, physical constraints, resource requirements, operational issues, management issues, waste generation issues, and cost. The current decommissioning schedule is discussed in Section 9 and presented in Appendix D. As shown on the schedule, decommissioning activities may be ongoing in two or more SETs at the same time. Detailed SET descriptions are provided in the RLCR. Summary descriptions are presented below. Removal, size reduction, and decontamination techniques and associated controls are discussed in Section 5.4. Step-by-step work instructions will be provided in the individual IWCP work packages for each SET.

SET 1 consists of Module A, including two central chainveyors (Chainveyors S3-A and S3-B), four tilt-pour furnace gloveboxes, a number of support gloveboxes, several gloveboxes with stationary furnaces and other equipment used for residue processing, overhead storage and transfer chainveyors, and the 707/776 transfer chainveyor, which runs from Module A, across the main corridor of Building 778, into Building 776/777. Work performed within the scope of this SET will include chemical and radiological cleanup activities, as well as the removal of asbestos, large pieces of glovebox equipment, gloveboxes, the chainveyors, several large electrical panels and buss bars, a small quantity of hazardous piping, the Zone I and Zone II ventilation ductwork and associated service piping and conduit, and the suspended ceiling.

SET 2 consists of Module B, including a central chainveyor (Chainveyor S4); the hydroform press; rolling, shearing, and de-brimming equipment; a lathe; a variety of heat-treating equipment and furnaces; overhead storage and transfer chainveyors; and a large continuous casting glovebox that was never put in service. Work performed within the scope of this SET will include chemical and radiological cleanup, as

[28] Rocky Flats Environmental Technology Site Decontamination and Decommissioning Characterization Protocol (M AN-077-DDCP), latest revision.

well as the removal of large pieces of equipment inside the gloveboxes, the gloveboxes, the chainveyors, several large electrical panels and buss bars, a significant quantity of hazardous piping, the Zone I and Zone II ventilation ductwork and associated service piping and conduit, and the suspended ceiling. Gloveboxes built around the forging equipment must be cut away as the equipment is dismantled.

SET 3 consists of Module C, including the basement beneath Module C (referred to as "C-Pit"); a central chainveyor (Chainveyor S5); several lathes, milling machines, and drill presses; and overhead storage and transfer chainveyors. C-Pit was used to collect and clean spent solvent and machine oil. It contains 16 pencil tanks, two annular tanks, one raschig ring tank, and associated piping. Work performed within the scope of this SET will include chemical and radiological cleanup activities, as well as the removal of large pieces of glovebox equipment, the gloveboxes, the chainveyor, the C-Pit tanks and ancillary equipment, several large electrical panels and buss bars, a significant quantity of hazardous piping and tanks, the Zone I and Zone II ventilation ductwork and associated service piping and conduit, and the suspended ceiling. Gloveboxes built around the machining equipment must be cut away as the equipment is dismantled.

SET 4 consists of Module D, including a central chainveyor (Chainveyor S6); a number of gloveboxes used for inspection of parts or, more recently, destruction of graphite molds; and overhead storage and transfer chainveyors. Work performed within the scope of this SET will include chemical and radiological cleanup activities, as well as removal of large pieces of glovebox equipment, the gloveboxes, the chainveyor, several large electrical panels and buss bars, a significant quantity of hazardous piping, the Zone I and Zone II ventilation ductwork and associated service piping conduit, and the suspended ceiling.

SET 5 consists of Module E, including a central chainveyor (Chainveyor S7); gloveboxes used for the final assembly, welding, cleaning, and inspection of parts and, more recently, for residue processing; and overhead storage and transfer chainveyors. Work performed within the scope of this SET will include chemical and radiological cleanup activities, as well as the removal of large pieces of glovebox equipment, the gloveboxes, the chainveyor, several large electrical panels and buss bars, a significant quantity of hazardous piping, the Zone I and Zone II ventilation ductwork and associated service piping and conduit, and the suspended ceiling.

SET 6 consists of Module F, including two downdraft tables and a small portion of Chainveyor S11. The remaining area is currently open and used for the storage and staging of residue drums. Work performed within the scope of this SET will include chemical and radiological cleanup activities, as well as removal of the downdraft tables and chainveyor, a small quantity of drywall, asbestos, the Zone I and Zone II ventilation ductwork and associated service piping and conduit, and the suspended ceiling.

SET 7 consists of Module G, including two beryllium lathes, brazing and welding equipment, several hoods, degreasers, and some pressure-testing equipment. The module is divided into a number of rooms where additional non-nuclear support activities were performed. Work conducted within the scope of this SET will include chemical and radiological cleanup activities, as well as removal of the beryllium-contaminated equipment, buss bars, a small quantity of hazardous piping, asbestos, the Zone I and Zone II ventilation ductwork and associated service piping and conduit, and the suspended ceiling and internal module walls.

SET 8 consists of Module H, including the areas surrounding eight autoclaves, furnaces, and associated equipment. Work performed within the scope of this SET will include chemical and radiological cleanup activities, as well as removal of the equipment and buss bars, asbestos, the Zone I and Zone II ventilation ductwork, and associated service piping and conduit. The autoclaves and the concrete rooms surrounding them will be decontaminated and removed during demolition.

SET 9 consists of Module J, Rooms 140 and 142, and the J Vault, including a central chainveyor (Chainveyor S16), several gloveboxes with plutonium metal and oxide furnaces, and storage and transfer chainveyors (i.e., J-K centerline to the X-Y Retriever). Work performed within the scope of this SET will include chemical and radiological cleanup activities, as well as removal of large pieces of glovebox equipment, the gloveboxes, several large electrical panels and buss bars, the Zone I and Zone II ventilation ductwork and associated service piping and conduit, and the suspended ceiling. Gloveboxes built around the casting equipment must be cut away as the equipment is dismantled.

SET 10 consists of Module K, Rooms 145 and 146, and the X-Y Retriever, including a central chainveyor (Chainveyor S16), several gloveboxes with plutonium metal furnaces, and storage and transfer chainveyors (i.e., J-K centerline to the X-Y Retriever). Work performed within the scope of this SET will include chemical and radiological cleanup activities, removal of large pieces of glovebox equipment, gloveboxes, buss bars, the Zone I and Zone II ventilation ductwork and associated service piping and conduit, as well as the suspended ceiling. A number of the gloveboxes were built around the casting equipment and may have to be cut away as the equipment is dismantled. The X-Y Retriever is a large (approximately 1,800 ft^2) Zone I room that will require extensive decontamination prior to size reduction.

SET 11 consists of the entire second floor of Building 707 (and 707A), including Rooms 200, 210, 220, and 240. Radiological contamination is present in the Zone I re-circulation and exhaust plenums (inert and air), Zone II exhaust plenums, room and corridor air supply, dry air system supply (including the Kathabar® dehumidification system), and the utilities controls. Work performed within the scope of this SET will include chemical and radiological cleanup activities, and removal of the mechanical, electrical, instrumentation and alarm systems associated with the air supply equipment. There is significant plutonium holdup in the Zone I ductwork upstream of the inert plenums, and significant asbestos remediation is required for the piping and dehumidification units.

SET 12 consists of the Contamination Area (CA) located in the southeast portion of Building 707 and the corridors connecting all the modules. This SET includes the rooms used for radiography and product QA, the dock and shipment preparation areas, the tool crib, and corridor ceilings. Work performed within the scope of this SET will include chemical and radiological cleanup activities, and removal of mechanical and electrical systems and associated instrumentation and alarm systems. Chainveyors connecting module gloveboxes are identified within the scope of specific modules, and not included in this SET.

SET 13 consists of the office and administrative areas located on the ground floor in the northeast corner of Building 707. Work performed within the scope of this SET will include removal of the mechanical, electrical, instrumentation, and alarm systems, including the ventilation equipment servicing the office areas. There is no significant radiological or chemical contamination associated with SET 13.

SET 14 consists of tank the systems located outside Building 707, including carbon tetrachloride, diesel fuel, argon, nitrogen, and helium tanks. There is no radiological contamination associated with SET 14. The tanks will be emptied during deactivation, and characterized and removed during decommissioning.

SET 15 consists of the Type 1 buildings located within the Building 707 Cluster. Decommissioning activities will be performed pursuant to the DPP. This SET is not included within the scope of this DOP and is identified here only for clarity.

SET 16 covers the final survey and demolition of the Type 3 and Type 2 buildings, including removal of the slabs, basement walls, and floors to a depth at least three feet below grade (see Section 5.5). Activities conducted within the scope of this SET will be coordinated with the ER program.

SET 17 covers the component removal, size reduction, and decontamination activities associated with the Type 2 buildings. Work performed within the scope of this SET will include chemical and radiological cleanup activities, and removal of equipment, buss bars, and ventilation ductwork and associated service piping and conduit in preparation for facility demolition.

The sequencing of decommissioning activities is identified in the Building 707 Closure Project Schedule, which is described in Section 9.0 and located in Appendix D of this DOP. The SETs have been prioritized based on the following considerations:

- Availability of decommissioning workers,
- Availability of specialized equipment (e.g., size reduction systems),
- Availability of storage space for process and remediation wastes,
- Availability of on-Site and/or off-Site waste treatment systems, and
- Availability of off-Site disposal facilities.

5.4 Facility Component Removal, Size Reduction, and Decontamination

In preparation for building demolition, facility components will be removed, size reduced, and/or decontaminated to meet applicable requirements (e.g., property reuse, waste management, and transportation requirements).

The sequence of these activities may be as described above or, where necessary, facility components may be size-reduced prior to removal or decontaminated prior to size reduction to improve efficiency and reduce worker exposure. For some equipment, size reduction and/or decontamination may not be required. Section 5.4.1 provides additional details on the component removal, size reduction, and decontamination process. Section 5.4.2 describes the methods that will be used to determine the safest, most cost-effective path to completion of the component removal, size reduction, and decontamination phase of decommissioning.

A variety of techniques are available to remove, size reduce, and decontaminate facility components. Section 5.4.3 describes the removal and size reduction techniques that may be used at RFETS, and Section 5.4.4 describes the decontamination techniques. Many of these techniques will be used to decommission the buildings with the 707 Cluster. Performance specifications for the techniques include meeting the applicable unrestricted release criteria shown in Table 4; minimizing the generation of hazardous, radioactive, and mixed wastes; minimizing ES&H impacts; and complying with Project ARARs.[29] In the event a new technique is developed and proposed for use at the Site, it will be evaluated through the ISMS and NEPA process to determine whether a modification to this DOP is required. If the impacts are determined to be different from or greater than those described in Section 8.0, Environmental Consequences, a modification will be prepared in accordance with the requirements of ¶127 of RFCA. The Building 707 Closure Project Manager will discuss any new techniques with the LRA prior to use.

DOE, its contractor, and subcontractors recognize that the potential for a release of hazardous and/or radioactive materials to the environment may occur both during and after removal of chainveyors, building ventilation and filtration systems, and/or contaminated portions of the building shell (e.g., an exterior wall or section of a roof). Sections 5.4.5, 5.4.6, and 5.4.7 address the special circumstances surrounding the removal of these building components.

[29] Rocky Flats Environmental Technology Site Value Engineering Study, August 1998.

Table 4. Unrestricted Release Criteria

Contaminant	Requirement Source	Unrestricted Release Threshold		
Radionuclides[30]		Total Average	Total Maximum	Removable
		(dpm/100 cm^2)	(dpm/100 cm^2)	(dpm/100 cm^2)
Transuranics	DOE Order 5400.5, Figure IV-1 DOE "No-Radioactivity Added" Waste Verification Program	100	300	20
Th-Natural		1000	3000	200
U-Natural		5000	15000	1000
Beta-Gamma emitters		5000	15000	1000
Tritium		N/A	N/A	10000
Hazardous Waste	6 CCR 1007-3, Parts 261 and 268	No listed hazardous waste or characteristic hazardous waste is present		
Beryllium	10 CFR 850.31	Loose surface contamination concentrations are less than 0.2 µg/100 cm^2		
Polychlorinated Biphenyls (PCBs)	40 CFR 761	<1 ppm for Bulk Remediation Waste; no threshold for Bulk Product Waste; various for PCB Items, PCB Liquids, and other PCB wastes		
Asbestos Containing Material (ACM)	40 CFR 763 5 CCR-1001-10	No sample in a sample set representing a homogeneous medium results in a positive detection (i.e., > 1% by volume)		

5.4.1 Overview of the Removal, Size Reduction, and Decontamination Process

Typically, facility component removal, size reduction, and decontamination activities will proceed in the sequence outlined below, although many of the activities may overlap. For instance, the pre-demolition survey may be conducted in rooms adjacent to decontamination activities, while removal activities are initiated in another part of the building. As activities are planned and executed, the RFCA consultative process will be used to provide opportunities for discussion and exchanges of information with the regulators and the general public. Detailed, step-by-step work instructions will be provided in individual IWCP work packages or activity-specific procedures.

1) Information collected during the RLC will be evaluated to determine the sampling and survey activities required to prepare the necessary work authorization documents, such as radiological work permits (RWPs) required by the RFETS radiological control program, job hazard analyses (JHAs) required by the IWCP process, and Environmental Checklists required by the environmental management program. In-process characterization will be performed to ensure work area hazards are identified, quantified, and controlled.

2) Prior to performing activities under this DOP, closure project personnel will participate in pre-evolution briefings (PEBs) to discuss the proposed work and to review the applicable safety requirements. The LRA has a standing invitation to PEBs.

3) Building floor drains and connections to exterior piping will be marked and sealed.

4) Asbestos containing material (ACM) will be identified and abated by a qualified subcontractor. The abatement activity will be carefully coordinated to minimize interference

[30] The unrestricted release criteria for radionuclides are taken from "Application of Surface Contamination Guidelines for DOE Order 5400.5," DOE, April 23, 1998.

with other activities and controls will be established to avoid disturbance of ACM during other activities.

5) Miscellaneous loose and fixed equipment and materials will be removed from the work area (e.g., lead from rooms, gloveboxes, cabinets and other equipment; electronic equipment and circuit boards from equipment and cabinets; brass and bronze fittings from piping, equipment, and cabinets; batteries from equipment and cabinets; mercury switches from equipment and cabinets; and empty aerosol cans).

6) As necessary, equipment and horizontal surfaces within the work area will be vacuumed and/or wiped down to remove any loose radiological and non-radiological contamination. This activity will be performed to minimize personnel exposure to potentially contaminated dust during subsequent decommissioning activities.

7) Electrical power to components will be de-energized, locked out/tagged out, and disconnected. Electrical systems that cannot be de-energized or that are required for continued closure activities will be identified and marked. Temporary power will be used, as necessary.

8) Remaining equipment within the work area will be removed. As a general rule, equipment located at floor level will be removed first to allow better access to overhead areas. Equipment removal may include the disassembly and decontamination of the equipment if it is determined to be cost-effective or necessary to ensure worker safety. Decontamination may be completed in place, or the equipment may be wrapped or coated to prevent the spread of contamination and moved to another area for decontamination and/or size reduction. Contamination controls may include both administrative controls (e.g., postings, roping) and engineered controls (e.g., temporary ventilation and filtration systems). Specific contamination controls will be detailed in the applicable work control documents. Facility components slated for unrestricted release will be surveyed in accordance with applicable Site procedures.

9) Items and loose debris within gloveboxes will be removed. Internal surfaces of gloveboxes may be wiped down, or more aggressive techniques may be used, such as abrasive/grit blasting or other methods described in Section 5.4.4. Lead shielding will be removed from external surfaces to minimize the generation of mixed waste.

10) Tank systems will be vented, purged, and drained to remove liquids. Ancillary piping will be removed first, using the best available method (e.g., disconnecting at a flanged joint, cutting with a wheel cutter or pipe crimping tool). Containment will be installed around the vacuum/vent lines and the tanks will be disconnected from the exhaust header. Tanks will be size reduced, as necessary to facilitate handling and packaging. Residual liquids and/or sludges in tanks and ancillary piping will be collected, characterized and managed in accordance with the applicable waste management requirements.

11) The building chainveyors will be removed as described in Section 5.4.5 of this DOP.

12) Based on radiological and/or chemical contamination levels, strippable or fixative coatings may be applied to remove or fix surface contamination during removal and size reduction operations.

13) Prior to removal of a contaminated glovebox, tank, or other component, radiological and chemical contamination control methods will be implemented to meet ES&H standards. Methods may include enclosing the component in a containment structure (e.g., tent), establishing ventilation control, use of fogging or fixative techniques, and/or decontamination. Depending on the layout of the room, the size of the component to be size

reduced, and contamination levels, a containment structure may be erected around the equipment in place, or the equipment may be moved to a size reduction facility. In any case, the containment structure will be equipped with HEPA ventilation to control the spread of contamination and minimize worker exposure.

14) Workers may size reduce components using a variety of mechanical and thermal cutting methods, including nibblers, saws, and plasma arc and oxygen burning cutters, as described in Section 5.4.3. Size reduction will be performed to minimize waste volume and to provide for packaging in approved containers. Waste material will be characterized, managed, and packaged in accordance with applicable waste management requirements (see Section 6.0).

15) As facility components are cleared from each work area, workers will complete the removal of the remaining utilities, including ventilation and filtration systems, and electrical power within the area. Removal of ventilation and filtration systems is discussed in Section 5.4.6.

16) In the event it becomes necessary to remove a contaminated portion of the building shell (e.g., a section of an exterior wall or part of a roof), the activity will be evaluated by a Site air quality SME and water management SME, and appropriate controls and monitoring requirements will be identified and implemented. A structural evaluation will be conducted by a Colorado registered professional structural engineer (i.e., P.E.) to identify shoring requirements. Structural members will be shored, as necessary, to maintain the overall structural integrity of the facility. Additional decontamination will be performed, as required. The area will then be sealed off and cross-contamination controls will be established to prevent re-contamination from activities in other work areas. Additional details regarding removal of contaminated portions of the building shell are provided in Section 5.4.7.

17) Groundwater collected in building sumps and/or vaults will be characterized and managed as incidental waters.[31] Details regarding groundwater management are provided in Section 5.5.3.7.6 (also see Table 15).

18) After components have been removed from the work area and, if necessary, contaminated portions of the building shell have been removed, interior and exterior building surfaces (i.e., walls, floors, ceilings) will be sampled and surveyed to determine the need for further decontamination and to verify the effectiveness of the decontamination process.

19) Upon completion of the removal and decontamination activities, a pre-demolition survey (PDS) will be performed to verify that the building may be released for demolition.

5.4.2 Material Disposition

As depicted in Figure 7, materials generated during the facility component removal, size reduction, and decontamination phase of decommissioning generally fall into seven categories[32]:

- Uncontaminated and/or decontaminated components that may be released for reuse or recycle,
- Radiologically or chemically contaminated components that may be released to other DOE facilities or other facilities authorized for reuse or recycle,
- Waste that may be disposed of in a sanitary landfill (i.e., sanitary and special sanitary waste);
- Radioactive, hazardous, mixed, or beryllium-contaminated waste that may be treated on Site;

[31] Control and Disposition of Incidental Waters, 1-C91-EPR-SW.01 (latest revision).

[32] The Site Treatment Plan describes waste streams not included in these categories.

Figure 7. Material & Waste Disposition Logic Flow

- Radioactive, hazardous, mixed, beryllium-contaminated, or TSCA-regulated waste that is not or cannot be treated on Site and must be disposed of in an off-Site treatment, storage, disposal (TSD) facility;
- Wastewater that may be treated on Site and released in accordance with the requirements of the RFETS National Pollutant Discharge Elimination System (NPDES) permit; and
- Wastewater that may be managed in accordance with the RFETS procedure for the control and disposition of incidental waters.[33]

Some materials may be decontaminated and rendered non-radioactive and/or non-hazardous prior to reuse, recycle, or disposal. Consistent with the objectives of RFCA, a cost-benefit analysis has been conducted to guide RFETS Closure Project Managers in determining the appropriate level and extent of decontamination and/or size reduction activities for their projects.[34] As part of the cost-benefit analysis, the costs of component removal activities were estimated, both with and without decontamination and/or size reduction. The estimate without decontamination or size reduction included a consideration of costs for component removal, property reuse or recycle, waste management, and PPE and other ES&H controls. The estimate with decontamination and size reduction included costs for component removal, additional costs associated with decontamination and size reduction (e.g., additional equipment, labor, PPE and other ES&H costs), and cost savings associated with decontamination and size reduction (e.g., reduced packaging, storage, shipment, treatment and disposal costs; and lower ES&H costs associated with material handling upon completion of decontamination and size reduction). Results of the analysis indicated that in most cases neither additional decontamination above that necessary for worker safety nor additional size reduction above that necessary to handle and package decommissioning wastes would be cost effective. However, in the case of specific pieces of process equipment (e.g., modestly contaminated gloveboxes), the cost to decontaminate equipment to meet the DOT criteria for surface-contaminated objects (SCO), and for shipment as SCO-LLW, is offset by the reduced cost to size reduce and package the material.

As the Building 707 Closure Project progresses, additional analyses may be required to compare cost impacts of new component removal techniques and approaches. These analyses will be performed as necessary, based on the logic and methodology presented in the referenced evaluations. Results of these analyses will be maintained in the Building 707 Closure Project Files.

5.4.3 Component Removal and Size Reduction Techniques, Hazards, Controls, and Monitoring

For the purposes of this DOP, component removal refers to the physical disassembly, size reduction (if necessary), and removal of facility components, including gloveboxes, tanks and ancillary piping, fume hoods, ventilation and filtration systems, other utilities and equipment, walls, ceilings, floors, and structural members. Component removal activities pose ES&H hazards that must be identified and controlled. Tables 5 through 11 present the key removal and size reduction steps by major facility component, the associated environmental hazards, and the environmental controls that may be used to mitigate those hazards. Sections 5.4.3.1.1 and 5.4.3.1.2 describe the specific techniques that will be used to disassemble and size reduce facility components, and Section 5.4.3.1.3 presents the ES&H hazards and controls associated with each technique.

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[33] Control and Disposition of Incidental Waters (1-C91-EPR-SW.01), (latest revision).

[34] C.M. Brown, "Evaluation of Potential Cost Impacts from Volume Reduction and Decontamination for TRU-Contaminated Systems and Equipment," and "Evaluation of Potential Cost Impacts from Volume Reduction, Decontamination, or Certification to Free-Release for Low Level Waste," September 14, 1998, K-H internal documents.

Size reduction will be performed to minimize waste volume. Depending on the circumstance, size reduction activities may be performed prior to removal or subsequent to removal. Size reduction may also be performed in the area where the removal occurred, in the area where wastes will be packaged, in a central location within the building, or in a separate on-Site size reduction facility. A key step in component removal may be decontamination. The various decontamination techniques and associated controls are presented in Section 5.4.4.

Table 5. Glovebox Removal Activities, Environmental Hazards, & Associated Controls

Key Steps	Environmental Hazards	Environmental Controls
Drain glovebox piping and criticality drains into containers using gravity, pumps, compressed air, and/or vacuum system	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Decontaminate glovebox, if necessary (see Section 5.4.4)	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Disconnect glovebox by detaching lines	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Size reduce glovebox, if necessary (see Sections 5.4.3.1.1 and 5.4.3.1.2)	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Haul away glovebox - may use mechanical lifting and hauling devices such as hoists, cranes, lift tables, machinery dollies, forklifts; and may containerize cut-up components	Radioactive and hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Seal glovebox openings (if glovebox is not containerized). Use spray fixative and/or stretch-wrapping if exterior is contaminated and exposed (i.e., not containerized). Package property for reuse or recycle in accordance with receiving facility acceptance criteria and DOT shipping requirements. Package waste in accordance with disposal facility WAC and DOT shipping requirements.

Table 6. Tank Removal Activities, Environmental Hazards, & Associated Controls

Key Steps	Environmental Hazards	Environmental Controls
Drain tank into containers using gravity, pumps, compressed air, and/or vacuum system; remove raschig rings (if applicable) and residual liquids and sludges	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Disconnect tank by detaching ancillary lines	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Excavate tank and ancillary lines (if necessary)	Radioactive and/or hazardous liquids and air emissions released to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Plan and implement removal per content-specific industry standards, regulations, and Site requirements. Inspect and approve equipment prior to use. Use certified operators.
Decontaminate tank, if necessary (see Section 5.4.4)	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Size reduce tank, if necessary (see Sections 5.4.3.1.1 and 5.4.3.1.2)	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be exposed. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Haul away tank – may use mechanical lifting and hauling devices such as hoists, cranes, lift tables, machinery dollies, and forklifts; and may containerize cut-up components	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Seal tank openings; use spray fixative and stretch-wrapping if item exterior is contaminated. Package property for reuse or recycle in accordance with receiving facility acceptance criteria and DOT shipping requirements. Package waste in accordance with disposal facility WAC and DOT shipping requirements.

Table 7. Piping Removal Activities, Environmental Hazards, & Associated Controls

Key Steps	Environmental Hazards	Environmental Controls
Drain piping into containers using gravity, pumps, compressed air, and/or vacuum system	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Disconnect piping (see Sections 5.4.3.1.1 and 5.4.3.1.2)	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Decontaminate piping, if necessary (see Section 5.4.4)	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Size reduce piping, if necessary (see Sections 5.4.3.1.1 and 5.4.3.1.2)	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be exposed. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Containerize piping and haul away	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Seal openings and use spray fixative and/or stretch-wrapping if exterior is contaminated and exposed (i.e., not containerized). Package property for reuse or recycle in accordance with receiving facility acceptance criteria and DOT shipping requirements. Package waste in accordance with disposal facility WAC and DOT shipping requirements.

Table 8. Fume Hood and Ventilation/Filtration System Removal Activities, Environmental Hazards, & Associated Controls

Key Steps	Environmental Hazards	Environmental Controls
Disconnect system (see Section 5.4.5)	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Decontaminate system, if necessary (see Section 5.4.4)	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Size reduce system, if necessary (see Sections 5.4.3.1.1 and 5.4.3.1.2)	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be exposed. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Haul away system using mechanical lifting and hauling devices such as hoists, cranes, lift tables, machinery dollies, and forklifts; may containerize system components	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Seal openings and use spray fixative and/or stretch-wrapping if item exterior is contaminated and exposed (i.e., not containerized). Package property for reuse or recycle in accordance with receiving facility acceptance criteria and DOT shipping requirements. Package waste in accordance with disposal facility WAC and DOT shipping requirements.

Table 9. Chainveyor Removal Activities, Environmental Hazards, & Associated Controls

Key Steps	Environmental Hazards	Environmental Controls
Disconnect system (see Section 5.4.5)	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be exposed. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Decontaminate system, if necessary (see Section 5.4.4)	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be exposed. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Size reduce system, if necessary (see Sections 5.4.3.1.1 and 5.4.3.1.2)	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be exposed. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Haul away system using mechanical lifting and hauling devices such as hoists, cranes, lift tables, machinery dollies, and forklifts; may containerize system components	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Seal openings and use spray fixative and/or stretch-wrapping if item exterior is contaminated and exposed (i.e., not containerized). Package property for reuse or recycle in accordance with receiving facility acceptance criteria and DOT shipping requirements. Package waste in accordance with disposal facility WAC and DOT shipping requirements.

Table 10. Equipment Removal Activities, Environmental Hazards, & Associated Controls

Key Steps	Environmental Hazards	Environmental Controls
Drain equipment into containers using gravity, pumps, and/or compressed air	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Disconnect equipment by detaching ancillary lines	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Decontaminate equipment, if necessary (see Section 5.4.4)	Radioactive and/or hazardous liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity(see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Size reduce equipment, if necessary (see Sections 5.4.3.1.1 and 5.4.3.1.2)	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be exposed. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Haul away equipment using mechanical lifting and hauling devices such as hoists and cranes; may contain, cranes, lift tables, machinery dollies, and forklifts; containerize cut-up components	Radioactive and/or hazardous air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Seal equipment openings and use spray fixative and/or stretch-wrapping if exterior is contaminated and exposed (i.e., not containerized). Package property for reuse or recycle in accordance with receiving facility acceptance criteria and DOT shipping requirements. Package waste in accordance with disposal facility WAC and DOT shipping requirements.

Table 11. Wall/Floor/Ceiling Removal Activities, Environmental Hazards, & Associated Controls

Key Steps	Environmental Hazards	Environmental Controls
Decontaminate wall, floor, and/or ceiling, if necessary (see Section 5.4.4)	Radioactive liquids and air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be drained or exposed. Collect liquids in critically safe containers. If liquids are highly contaminated, cover adjacent surfaces with plastic or other protective material. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Dismantle wall, floor, and/or ceiling (see Sections 5.4.3.1.1 and 5.4.3.1.2)	Radioactive air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Maintain a negative pressure between the work area and surrounding environment. Construct temporary containment around the work area if very high levels of radioactive materials are to be exposed. Use building and/or temporary HEPA filtration system and project-specific and/or Site-wide air monitoring network.
Haul away sections using mechanical lifting and hauling devices such as hoists, cranes, lift tables, machinery dollies, and forklifts; containerize rubble	Radioactive air emissions released into the building and to the environment	Conduct ES&H reviews prior to activity (see Section 5.1). Package property for reuse or recycle in accordance with receiving facility acceptance criteria and DOT shipping requirements. Package waste in accordance with disposal facility WAC and DOT shipping requirements. Conform with the requirements of the RFCA RSOP for Recycling Concrete.

5.4.3.1 Component Removal and Size Reduction Techniques

Techniques used to disassemble, and/or size reduce facility components may be categorized as mechanical disassembly and cutting techniques, and thermal cutting techniques. Mechanical techniques employ manual, electrical, pneumatic, and/or hydraulic forces (e.g., shear) and motions (e.g., reciprocating, circular) to cut and/or break equipment or systems into pieces. Thermal techniques produce a flame or electrical arc to cut and/or break the equipment or systems by melting them. Techniques used to remove facility components may involve the use of common construction equipment, including excavators (e.g., backhoes), hoists, and cranes.

Mechanical techniques include simple disassembly using hand tools or power saws and shears, circular cutters, crimpers, abrasive cutters, diamond wire cutters, paving breakers (i.e., jackhammers), pulverizers, grapples, rams, and non-explosive cracking agents. Thermal techniques include plasma arc, oxygen-burning, and laser cutters; arc saws; and abrasive water-jet cutters. In general, mechanical techniques are most appropriate for cutting wood, plastic, glass, concrete, and thin metal (i.e., < 3/8" thickness) systems and components, such as piping. Thermal techniques are most often used to cut thicker metal, such as gloveboxes, chainveyors, heavy equipment, and tank systems. Most of these mechanical and thermal techniques may be hand-held, stationary, or configured for remote control.

In 1998, the RFETS Technology Steering Committee examined a variety of size reduction techniques for use during decommissioning. The Committee is currently evaluating advanced size reduction techniques, including robotics and remote-operated vehicles (ROVs). As part of this effort, a controlled technology deployment has been initiated to promote worker safety, minimize waste generation, and increase cost effectiveness. Initial efforts were based on soft-sided containment tents in which size reduction activities would be performed. Subsequent efforts have focused on the development and deployment of the hard-sided inner tent demolition chamber (ITDC). Activities are currently under way to deploy the first remote operations size reduction system (ROSRS) in Building 776/777 in FY2001. The ROSRS will use remote-controlled robotic arms to perform both thermal and mechanical size reduction activities. Other size reduction technologies currently under development include the in-situ size reduction system (ISSRS), which will use mobile robots to perform mechanical and thermal size reduction operations.

After facility components have been disconnected and disassembled, they will be size reduced and/or decontaminated (if necessary), then packaged for reuse, recycle, or disposal. Removal of large items, such as tanks, equipment, and sections of walls and flooring, will be accomplished using mechanical lifting and hauling devices, such as hoists and cranes. Excavators, such as backhoes, will be used to excavate around and access underground components, such as underground storage tanks and ancillary lines. Such devices will be inspected and approved for the work, and operated by qualified operators. If contaminated, items will be contained prior to removal to prevent the release and spread of contamination (e.g., spraying the item with a fixative and stretch-wrapping it).

5.4.3.1.1 Mechanical Removal and Size Reduction Techniques

Mechanical techniques include small tools, such as hand-held saws with hardened-steel blades, which cut through construction materials, such as wood, plastics, glass, Plexiglas®, Benelex®, lead, and glovebox filters. Hydraulic shears are two-bladed tools that operate on the same principle as a conventional pair of scissors. Shears may be hand-held or mounted on a skid or excavator, which provides hydraulic power and a mechanism for manipulating the shears. A shear baler is a device that may be used to reduce an entire glovebox into a high-density bale that will fit into a standard waste box.

Split-frame pipe and tool cutters are designed to cut in-line piping. These devices are mounted around the outside diameter of a section of pipe and will sever, bevel, and counterbore the material being worked. Diamond wire cutting involves a series of guide pulleys that draw a continuous loop of multi-strand wire

strung with diamond beads and spacers through the surface to be cut. High-pressure water cutters use water mixed with an abrasive, such as garnet, to cut through steel. Typically, high-pressure water cutters are mounted on an automated, multi-axis system. Arbor presses are devices used to press odd-sized pieces of metal, such as glovebox corners and tubing, into manageable pieces.

Non-explosive cracking agents may be used to fracture concrete. The cracking agent is a powder, liquid, or putty that is mixed with water and poured into holes drilled in concrete. As it hardens, pressures up to 12,000 psi are exerted, causing the concrete to fracture.

5.4.3.1.2 Thermal Removal and Size Reduction Techniques

Thermal techniques include plasma and electric arc cutters, which operate by establishing a direct current arc in a gas or gas mixture that flows through the cutting torch nozzle to the metal being cut. A stream of positively charged ions and free electrons is ejected from the torch nozzle at a very high velocity, melting the metal. During cutting, the molten metal is ejected in the form of fine sparks, which are blown away from the torch head. Oxygen burning cutters use a flowing mixture of fuel gas and oxygen ignited at the torch head to heat metal to high temperatures and "burn" it away. One such system consists of a torch that feeds oxygen and electrical power to an exothermic cutting rod, which is placed in direct contact with the piece to be cut, then dragged in the direction of the cut. Laser cutting systems melt and vaporize the metal.

5.4.3.1.3 ES&H Hazards, Controls, and Monitoring

Removal and size reduction techniques and activities present hazards to workers and the environment. Therefore, removal and size reduction activities will be carefully planned to include detailed area characterization and hazard evaluations. Decontamination will be considered prior to the use of removal and size reduction techniques when elevated levels of contamination are present. Engineering and administrative controls (e.g., localized ventilation and RWPs) will be implemented, as necessary, to maintain employee exposure as low as reasonably achievable (ALARA). Robotics may also be employed. Some removal and size reduction techniques will be performed after ventilation and filtration systems have been removed; therefore, personnel and environmental monitoring will be implemented commensurate with the risk. Environmental monitoring may include Site-wide and project-specific air and surface water monitoring. Table 12 summarizes the hazards and controls associated with each of the component removal techniques described in this section.

Table 12. Component Removal/Size Reduction Hazards and Controls

Removal Technique(s)	Potential Hazards	Hazard Controls	Comments
Hand tools (hammers, wood saws, metal saws, screw drivers, pliers, sheet metal cutters, wrenches, etc.) Power tools (drills, circular saws, reciprocating saws, shears)	Cuts, abrasions, punctures, electrocution, and other bodily injury. Eye hazards from airborne chips, cuttings and fragments. Potential for radiological and chemical exposure and contamination, including wound contamination. Potential to spread contamination and cause contaminants to become airborne (e.g., from exhaust and cooling air blowing on contaminated surfaces). Explosive hazard using sparking tools (e.g., drill motors) in areas where volatile chemicals have been used.	Training on job-specific hazards, related procedures, and proper use of tools. PPE and personnel monitoring. Periodic tool inspections and inspection of tools prior to use. Decontamination and use of fixatives prior to elevated contamination levels are present. Use of engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance). "Hot Work" permit (i.e., permit to work on energized equipment).	Contamination levels will be well identified prior to use. Workers who will perform the work determine the best tool for the task. Training will be provided for new and unique operations. Engineering controls are the primary means to minimize personnel exposure to the hazard. PPE is the backup and supplements the engineering controls to allow the work to be completed. Air and personnel monitoring will be performed, as appropriate, to determine the effectiveness of decontamination and engineering controls. Use of sparking tool is not allowed in an explosive environment.
Paving breakers, jackhammers, and similar tools to break up concrete	Pressurized connections, bodily injury from blade point and flying objects, eye hazard, noise. Potential for radiological and chemical exposure and contamination, including wound contamination. Personnel injury due to vibration. Personnel injury due to improper lifting of heavy equipment.	Training on job-specific hazards, related procedures, and the proper use of equipment. PPE and personnel monitoring. Periodic equipment inspections and inspection of equipment prior to use. Decontamination and use of fixatives prior to use if elevated contamination levels are present.	Contamination levels will be well identified prior to use. Workers who will perform the work determine the best tool for the task. Workers will be trained in the proper lifting techniques. Engineering controls are the primary means to minimize personnel exposure to the hazard. PPE is the backup and

Removal Technique(s)	Potential Hazards	Hazard Controls	Comments
	Potential to spread contamination and cause contaminants to become airborne.	Use of engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance).	supplements the engineering controls to allow the work to be completed. PPE will include special vibration gloves and work controls will include frequent personnel rotation. Air and personnel monitoring will be performed, as appropriate, to determine the effectiveness of decontamination and engineering controls.
Plasma and electric arc cutters	Fire. Bodily injury, including blindness and burns, hearing impairment, and smoke inhalation. Potential for radiological and chemical exposure and contamination, including wound contamination. Potential to spread contamination and cause contaminants to become airborne.	Use of spark and light shields. Verification of fire protection adequacy, including establishment of fire watch, as necessary. Training on job-specific hazards, related procedures, and the proper use of equipment. PPE and personnel monitoring. Periodic equipment inspections and inspection of equipment prior to use. Decontamination prior to use if there are elevated contamination levels. Use of engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance). “Hot Work” permit (i.e., permit to work on energized equipment).	Relief space behind work piece is required. Combustibles will be removed from the work area. Contamination levels will be well identified prior to use. Workers who will perform the work will determine the best tool for the task. Engineering controls are the primary means to minimize personnel exposure to the hazard. PPE is the backup and supplements the engineering controls to allow the work to be completed. Air and personnel monitoring will be performed, as appropriate, to determine the effectiveness of decontamination and engineering controls. Task-specific requirements will be included in the hot work permit (e.g.,

Removal Technique(s)	Potential Hazards	Hazard Controls	Comments
			removal of paint from work surface).
Oxy-torch cutters	Bodily injury, including blindness and burns, hearing impairment. Potential for radiological and chemical exposure and contamination, including wound contamination. Potential to spread contamination and cause contaminants to become airborne.	Training on job-specific hazards, related procedures, and the proper use of equipment. PPE and personnel monitoring. Periodic equipment inspections and inspection of equipment prior to use. Decontamination prior to use if elevated contamination levels are present. Use of engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance). "Hot Work" permit (i.e., permit to work on energized equipment).	Combustibles will be removed from the work area. Contamination levels will be well identified prior to use. Air and personnel monitoring will be performed as appropriate to determine the effectiveness of decontamination and controls and to monitor for potential uptakes, exposure of Site population, and off-Site releases.
Laser cutters	Eye hazard, skin wounds, and electrocution. Potential for radiological and chemical exposure and contamination, including wound contamination. Potential to spread contamination and cause contaminants to become airborne.	Training on job-specific hazards, related procedures, and the proper use of equipment. PPE and personnel monitoring. Periodic equipment inspections and inspection of equipment prior to use. Decontamination and use of fixatives prior to use if elevated contamination levels are present. Use of engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to	Contamination levels will be well identified prior to use. Combustibles will be removed from the work area. Air and personnel monitoring will be performed as appropriate to determine the effectiveness of decontamination and controls and to monitor for potential uptakes.

Removal Technique(s)	Potential Hazards	Hazard Controls	Comments
		control exposure (e.g., shielding, time and distance).	
Diamond wire saws	Flying objects if wire breaks and related bodily harm, hearing impairment, and eye hazard. Potential for radiological and chemical exposure and contamination, including wound contamination. Potential to spread contamination and cause contaminants to become airborne.	Training on job-specific hazards, related procedures, and the proper use of equipment PPE and personnel monitoring. Periodic equipment inspections and inspection of equipment prior to use. Decontamination prior to use if elevated contamination levels are present. Use of engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance).	Workers must have access to both sides of the material to be cut. Contamination levels will be well identified prior to use. Combustibles will be removed from the work area. Workers who will perform the work determine the best tool for the task. Engineering controls are the primary means to minimize personnel exposure to the hazard. PPE is a backup and supplements the engineering controls to allow the work to be completed. Air and personnel monitoring will be performed, as appropriate, to determine the effectiveness of decontamination and engineering controls.
Wachs cutters, hydraulic shears, shear bailers, water cutters (using abrasives), arc air slice, and arbor press	Bodily injury from pressurized connections (i.e., cutters and flying objects). Cuts from sharp edges. Hearing impairment due to high noise. Potential for radiological and chemical exposure. Potential to spread contamination Potential to cause contamination to become airborne	Training on job-specific hazards, related procedures, and the proper use of equipment. PPE (e.g., use of leather gloves, hearing protection) and personnel monitoring. Periodic equipment inspections and inspection of equipment prior to use. Shielding of highly pressurized fittings. Decontamination prior to use if elevated contamination	Contamination levels will be well identified prior to use. Workers who will perform the work determine the best tool for the task. Engineering controls are the primary means to minimize personnel exposure to the hazard. PPE is a backup and supplements the engineering controls to allow the work to be completed. Air and personnel monitoring will be

Removal Technique(s)	Potential Hazards	Hazard Controls	Comments
		levels are present. Use of engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance).	performed, as appropriate, to determine the effectiveness of decontamination and engineering controls.
Non-explosive cracking agents	Bodily injury, eye hazard (drilling required to create holes into which cracking agent is introduced). Trips and falls due to exposed voids. Potential release of contamination within building or to the environment. Fugitive dust.	Training on job-specific hazards, related procedures, and the proper use of equipment. PPE and personnel monitoring. Periodic equipment inspections and inspection of equipment prior to use. Decontamination prior to use if elevated levels of contamination are present. Use of engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance).	Contamination levels will be well identified prior to use. Workers who will perform the work determine the best tool for the task. Engineering controls are the primary means to minimize personnel exposure to the hazard. PPE is a backup and supplements the engineering controls to allow the work to be completed. Air and personnel monitoring will be performed, as appropriate, to determine the effectiveness of decontamination and engineering controls.
Excavators, hoists, cranes, lift tables, machinery dollies, and forklifts	Bodily injury. Falling load. Damage to property. Potential release of contamination within building or to the environment.	Preparation and use of a Lifting Plan. Training on job-specific hazards, related procedures, and the proper use of equipment. PPE and personnel monitoring. Periodic equipment inspections and inspection of equipment prior to use.	Required equipment operation certifications will be current.

5.4.4 Decontamination Techniques, Hazards, Controls, and Monitoring

Decontamination is defined as the removal of contamination from building and equipment surfaces and beneath surfaces by manual, mechanical, chemical, or other means. The purpose of decontamination is to reduce exposure to radiological and chemical hazards, minimize the generation of radioactive and hazardous waste, and to salvage equipment and materials for future use. Depending on the circumstance, decontamination activities may be performed prior to removal or subsequent to removal. Decontamination may also be performed in the area where the removal occurred, in the area where wastes are to be packaged, in a central location within a building, or in a separate on-Site decontamination facility, depending on operational safety and cost-effectiveness. In many cases, the techniques discussed below are effective for both radioactive and chemical contamination. The decision process used to determine the nature and extent of decontamination is summarized in Figure 8. The logic used to select the most appropriate decontamination technique(s) is summarized in Figure 9.

Manual and mechanical decontamination techniques may be classified as either surface cleaning (e.g., vacuuming, wiping, scrubbing, washing, application and removal of strippable coatings) or surface removal (e.g., abrasive blasting, grinding, spalling, scarifying). Manual and mechanical techniques are most effective on porous and non-porous surfaces that are easily accessible, such as floors and walls.

Chemical decontamination techniques employ concentrated or dilute solutions to erode or flush loose contaminated debris from a surface, or to dissolve the contamination. Chemical decontamination techniques are most effective on non-porous surfaces that are relatively inaccessible, such as interior pipe surfaces.

5.4.4.1 Manual and Mechanical Decontamination Techniques

Manual and mechanical decontamination techniques include vacuuming, wiping, scrubbing, and washing, which involve the physical removal of dust, fine particles, and loose debris from building and equipment surfaces using common cleaning techniques. Typically, dusting involves the use of a dry cloth and wiping involves the use of a damp cloth, which may be soaked with water, detergent, or non-hazardous solvent to assist in removing particulates. Washing and scrubbing are similar to wiping except that pressure is applied to assist in removing the contamination. Vacuuming involves the physical removal of particulates or liquids with a suction device. Particulates are removed using a commercial- or industrial-grade vacuum equipped with a HEPA filter. Liquids are removed using a “wet vacuum” equipped with an alternate filtration system. Hydroblasting uses a high-pressure (i.e., several thousand pounds per square inch) water jet to remove contaminated debris from large and/or inaccessible surfaces. System configurations range from a jet tip, which produces a narrow stream, to a fan-shaped tip, which produces a flat stream. Strippable coatings may be applied to contaminated surfaces, then removed with some of the contamination. Strippable coatings are applied using a mixture of two polymers that chemically react to form the coating. Usually, the contaminated layer is pulled off, containerized, and disposed of as contaminated waste. Decontamination factors for the strippable coatings vary with the type of coating used. In general, strippable coatings are only effective on smooth, non-porous surfaces.

Scarifiers are used to abrade coated and uncoated concrete and steel surfaces. The scarification process physically removes contaminated surface layers. For steel surfaces, scarifiers may completely remove contaminated coating systems, including mill scale. This leaves a surface of bare metal. A scabbling scarification process may be used to achieve the desired profile and results for contaminated concrete. A needle-scaling scarification process may be used for steel decontamination. Vacuum attachments may be used to reduce the spread of contamination associated with the scarification process.

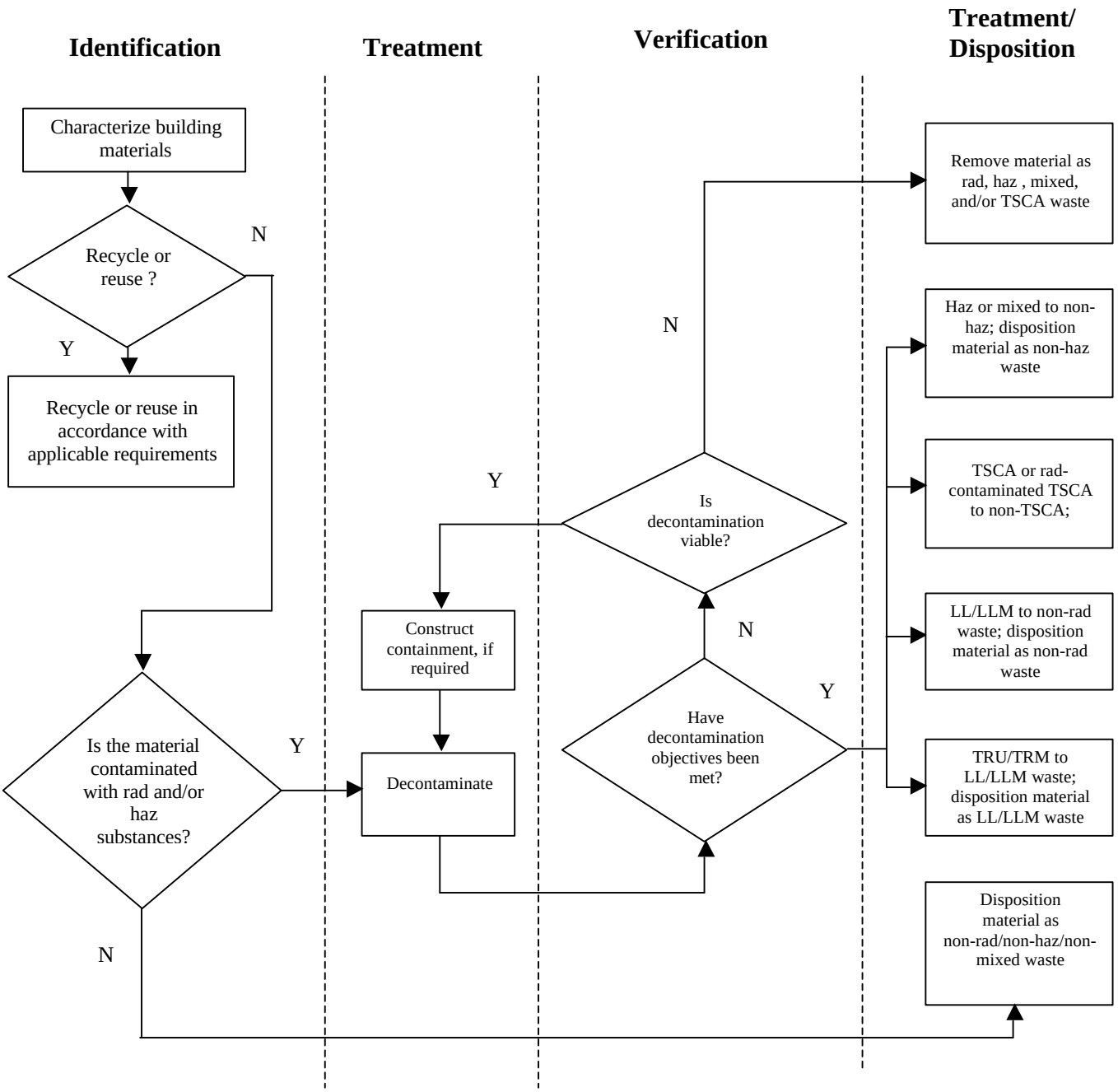

Figure 8. Decontamination Decision Tree

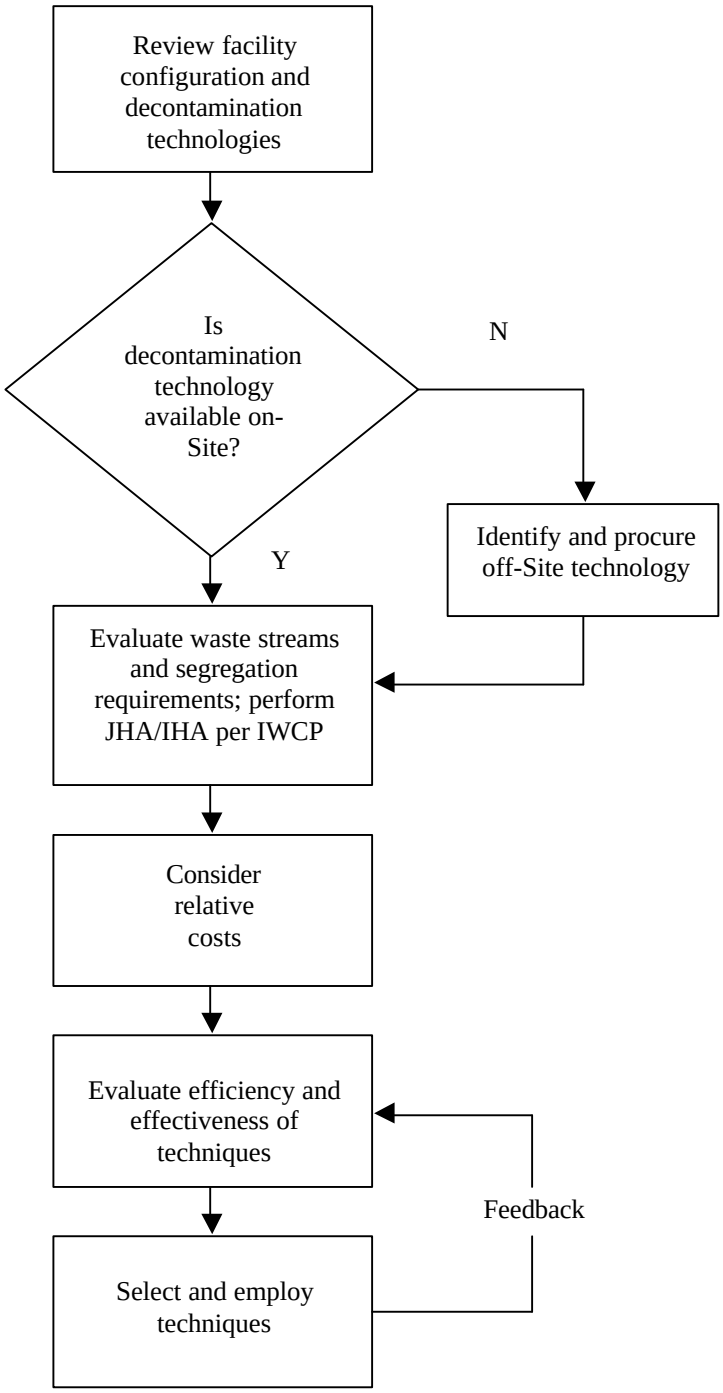

Figure 9. Decontamination Technique Selection Logic

Paving breakers and chipping hammers are used to remove contamination and surface material by mechanical impact, referred to as spalling. Although paving breakers and chipping hammers are primarily used in demolition activities, they may also be used to remove surface contamination up to six inches thick, resulting in a rough remaining surface.

Grit blasting, also referred to as sand blasting or abrasive jetting, uses abrasive materials suspended in a medium (e.g., compressed air, water, or a combination of air and water) to pulverize and grind out surface contaminants. Typically, blasting results in the uniform abrasion of a surface. Typical abrasives include minerals, steel pellets, glass beads, glass frit, plastic pellets, and natural products, such as sand. Grit blasting systems consist of a blast gun, pressure lines, abrasives, and air compressor.

Carbon dioxide (CO_2) blasting is a variation of grit blasting, where CO_2 pellets are used as the abrasive medium. The pellets shatter as they impact the surface, penetrating the base material and releasing the contaminants. The CO_2 fragments immediately sublimate, adding a lifting force, which aids in removing the contaminants. Abraded debris falls to the ground, and the CO_2, now a gas, returns to the atmosphere.

5.4.4.2 Chemical Decontamination Techniques

Water is a universal decontamination agent that acts by dissolving contamination or by eroding and flushing loose debris from the contaminated surface. It is most effective on non-porous surfaces, and may be made more effective by increasing its temperature, adding a detergent or surfactant, or using a water jet.

Detergents are used to remove grease, dirt, and some organic materials. Surfactants produce similar results by lowering liquid surface tension and providing better contact between the surface and the liquid.

Strong mineral acids, such as hydrochloric acid (HCl), nitric acid (HNO_3), sulfuric acid (H_2SO_4), and phosphoric acid (H_3PO_4), cerium nitrate $Ce(NO_3)_4$, and organic or weak acids, such as oxalic acid ($C_2H_2O_4$), citric acid ($C_6H_8O_6$), and sulfamic acid (HSO_3NH_2) may be used to remove contamination by dissolving metal oxide films and increasing the solubility of the metal ions.

5.4.4.3 ES&H Controls and Monitoring

Decontamination may be complex due to the type and form of the contaminant, and the surface characteristics of the material to be decontaminated. As a result, accepted decontamination techniques will be used, and detailed information regarding the contaminants present, the type of contamination (e.g., fixed versus removable, liquid versus solid), the areal extent and levels of contamination, and the properties of the contaminated material(s) will be considered.

Many of the decontamination techniques described above are useful in a broad number of applications, including low levels to very high levels of contamination. Pre-decontamination planning, area characterization, and hazard evaluations will be performed to select the most effective technique(s) for each application. Areas of highest contamination will be considered for removal or decontamination first, and areas with loose contamination will be decontaminated before areas with fixed contamination. Engineering and administrative controls will be implemented, as necessary, to reduce personnel exposure to contamination, and confirmatory sampling and analysis will be performed to verify the decontamination activities have been successful. Table 13 summarizes the hazards and controls associated with each of the decontamination techniques described in this section.

Table 13. Decontamination Hazards and Controls

Decontamination Technique	Associated Hazards	Hazard Controls	Comments
Wiping, scrubbing, and/or washing with detergent	Potential to spread contamination and cause contaminants to become airborne. Potential for personnel contamination when using liquids for decontamination. Electrical hazard from energized equipment. Potential for nuclear criticality.	Provide training on job-specific hazards and related procedures. Use proper PPE to prevent personnel contamination. Use engineering and administrative controls, including containment and ventilation/filtration, postings, RWPs, and other ALARA principles, to control personnel exposure (e.g., shielding, time and distance). De-energize equipment prior to decontamination. Use appropriate system to collect, store, and treat wastewater.	Contamination levels will be well identified prior to use. Dusting (i.e., dry decontamination) should never be performed in areas where contaminated dust may be re-suspended and released to the environment. Sanitary drains will be blocked to prevent contaminated water from reaching the sanitary sewer. Air monitoring will be performed.
Vacuuming	Potential for nuclear criticality and/or elevated dose rates from consolidation of material. Potential to spread contamination due to filter failure and/or exhaust ventilation of vacuum in areas of higher contamination.	Provide training on job-specific hazards and related procedures. Use proper PPE to prevent personnel contamination. Use HEPA-filtered vacuums. Use critically safe vacuum (i.e., vacuum cleaner that cannot accumulate a critical mass of fissile material) if the amount of material to be vacuumed is significant. Conduct radiation surveys to identify maximum amounts of material that may be safely decontaminated. The required survey frequencies (e.g., for dose rates, HEPA filter testing, and filter change-out/cleaning) will be identified in the applicable work control documents. Use engineering and administrative controls, including containment and ventilation/filtration, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance).	Contamination levels will be well identified prior to use. Will identify maximum material amounts that can be safely decontaminated, survey frequencies for dose rates, DOP testing frequencies, and filter change-out/cleaning frequencies. Air monitoring will be performed.
Strippable coatings	Skin and eye contact hazards; fumes and vapors. Potential for elevated dose rates due to	Perform frequent dose rate surveys of stripped material if there is a potential for elevated dose rates. Provide training on job-specific hazards and related	Air monitoring will be performed. Contamination surveys will be performed on bare materials after paint has been stripped.

Decontamination Technique	Associated Hazards	Hazard Controls	Comments
	build-up in removed paint. Potential elevated contamination levels as coatings are removed. Criticality potential as coatings are removed and containerized. Electrical hazard from energized equipment.	procedures. Use proper PPE to prevent personnel contamination. Use engineering and administrative controls, including containment and ventilation/filtration, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance). Use engineering and administrative controls to ensure a critical mass cannot be accumulated. De-energize equipment prior to decontamination.	
Hydroblasting and/or high-pressure steam cleaning	Potential to spread contamination. Potential for contamination to become airborne. Potential for personnel contamination. Potential for electrical hazards if energized equipment is present. Eye and noise hazard. Potential for bodily harm (e.g., cutting skin/bone, burns from steam).	Provide training on job-specific hazards, related procedures, and equipment. Inspect equipment prior to use. Use proper PPE, including hearing protection. Use engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance). De-energize equipment prior to decontamination. Use appropriate system to collect, store, and treat wastewater. Rotate personnel and closely monitor personnel for signs of fatigue.	Contamination levels will be well identified prior to use. Areas of higher contamination can be wet down prior to using higher pressures. Air monitoring will be performed. Use appropriate amount of pressure to safely decontaminate material Sanitary drains will be blocked, as necessary, to prevent contaminated water from reaching the sanitary sewer.
Grinders, scarifiers, scabblers, paving breakers, chipping hammers, and/or spalling	Potential to spread contamination. Potential for contamination to become airborne. Potential for personnel contamination. Physical, eye, and noise hazards. High vibration and motion of equipment.	Provide training on job-specific hazards, related procedures, and equipment. Inspect equipment prior to use. Use proper PPE, including hearing protection and vibration protection gloves. Use engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure.	Contamination levels will be well identified prior to use. Air monitoring will be performed.

Decontamination Technique	Associated Hazards	Hazard Controls	Comments
		Rotate personnel and closely monitor personnel for signs of fatigue.	
Abrasive/grit blasting	Potential to spread contamination. Potential for contamination to become airborne. Potential for personnel contamination. Physical, eye and noise hazards.	Provide training on job-specific hazards, related procedures, and equipment. Inspect equipment prior to use. Use proper PPE, including hearing protection. Use engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance).	Contamination levels will be well identified prior to use. Air monitoring will be performed.
Carbon dioxide (CO_2) blasting	Potential to spread contamination and cause contaminants to become airborne. Potential for personnel contamination. Physical, eye and noise hazards. Potential for carbon dioxide buildup.	Provide training on job-specific hazards, related procedures, and equipment. Inspect equipment prior to use. Use proper PPE, including hearing protection. Use engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure.	Contamination levels will be well identified prior to use. Air monitoring will be performed, including CO_2 monitoring.
Strong mineral acids and/or cerium nitrate	Potential to spread contamination. Potential for contamination to become airborne. Potential for personnel contamination. Skin and eye contact hazards; fumes and vapor. Hazards associated with use of incompatible chemicals. Electrical hazard from energized equipment.	Provide training on job-specific hazards and related procedures. Use proper PPE. Use engineering and administrative controls, including containment and ventilation/filtration systems, postings, RWPs, and other ALARA principles, to control exposure (e.g., shielding, time and distance) and to prevent use of incompatible chemicals. De-energize equipment prior to decontamination. Use appropriate system to collect, store, and treat wastewater.	Contamination levels will be well identified prior to use. Type of contaminants and incompatibles will be known in advance. Will use least toxic and/or diluted chemicals that can safely achieve desired level of decontamination. Air monitoring will be performed. Sanitary drains will be blocked to prevent contaminated water from reaching the sanitary sewer.

5.4.5 Removal of the Building Chainveyor System

Transfer systems built inside the Building 707 chainveyors are used to move nuclear material between gloveboxes within a single module and between modules. The chainveyor system is shown in Figure 10.

The chainveyors are rectangular in shape and flanged at each end. The flanges are bolted together to provide an air-tight housing. Typically, the chainveyors are located near the dropped ceiling to minimize operator interference. The chainveyors also serve to direct ventilation flow and maintain containment during material transfer. Lead shielding mounted on the outside of the chainveyors is used to reduce personnel exposure.

During decommissioning, the chainveyors will be disassembled and lowered to the floor in sections. The sections will be size reduced (if necessary) and packaged for off-Site disposal. Lead shielding will be removed prior to packaging. The removal sequence will vary from location to location. For example, the chainveyor that runs through Modules D and E may be removed with Module D or Module E, or it may be left in place and removed at the time Corridor M components are removed. However, because the chainveyors have internal contamination, the openings to each section will be contained (e.g., sealed with plastic and tape) during the removal process, and ventilation through the chainveyor will be maintained, as necessary, to prevent the release of contamination.

5.4.6 Removal of Building Ventilation and Filtration Systems

As facility components are removed and/or decontaminated, workers will complete the removal of remaining utilities, including building ventilation and filtration systems. Because ventilation and filtration systems are important environmental controls, and because some of these systems may contain radiological and/or chemical contamination, the removal of these systems poses a potential for releases of hazardous and/or radioactive materials to the environment. As a result, the removal sequence is extremely important and will be planned carefully for each Type 3 and Type 2 building within the Building 707 Cluster. Typically, the removal sequence will proceed as described below, and as depicted in Figure 11.

- Early in the work planning process, project engineers, building stationary operating engineers, and radiological engineers will perform air-flow studies in accordance with the DOE-approved RFETS Radiological Control Manual to identify ventilation requirements for the activity (i.e., whether the existing ventilation must be adjusted and/or whether additional temporary ventilation must be added).
- Zone I plenums and associated filtration systems will be maintained until the gloveboxes and ductwork they service have been stripped out.
- Where possible, gloveboxes will be removed “upstream to downstream” (i.e., towards the filter plenums) to ensure that air continues to flow from areas of least contamination to areas of higher contamination. During this time, radiological engineers will verify that air is continuing to flow from areas of least contamination to areas of greater contamination and they will work with the building stationary operating engineers to ensure negative pressure is maintained in accordance with applicable AB requirements (i.e., the Building 707 Basis for Interim Operation [BIO]). Air flow will be maintained in the desired direction using the remaining Zone I and Zone II systems and/or temporary ventilation and filtration systems, as necessary.

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Persons with access to Unclassified Controlled Nuclear Information (UCNI) may obtain this information from the Building 707 Closure Project Manager.

Figure 10. Building 707 Chainveyor System

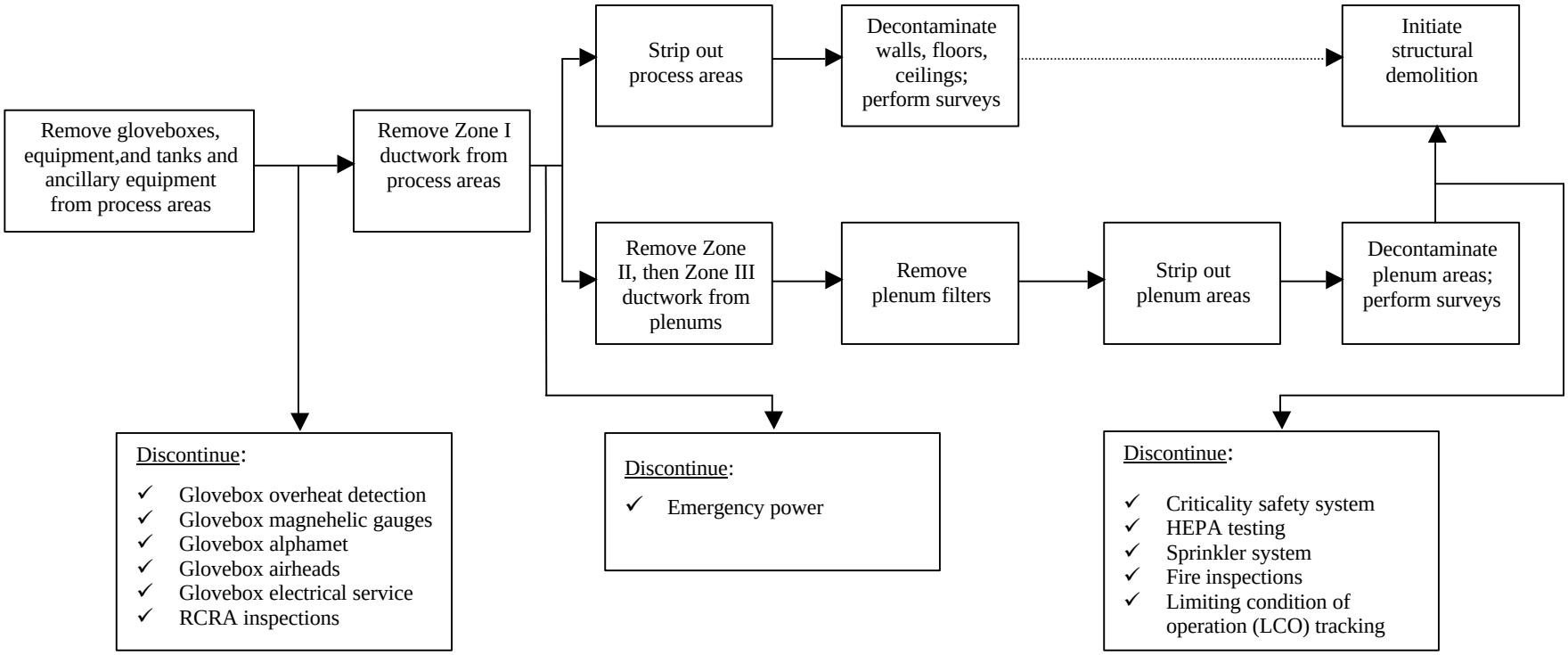

Figure 11. Removal Sequence for Building Ventilation and Filtration Systems

- Once all Zone I gloveboxes and ductwork have been removed from the area or rooms they service, and those areas or rooms have been controlled (i.e., contained or decontaminated to meet applicable decontamination goals), the Zone II and then Zone III plenums and associated ductwork may be removed. During this time, radiological engineers will verify that air is continuing to flow from areas of least contamination to areas of greater contamination, and they will work with the building stationary operating engineers to ensure negative pressure is maintained in accordance with applicable AB requirements (i.e., the Building 707 Basis for Interim Operation [BIO]). Air flow will be maintained in the desired direction using the remaining Zone I and Zone II systems and/or temporary ventilation and filtration systems, as necessary.
- Some ductwork may be removed without removing associated holdup to maintain worker exposure as low as reasonably achievable (ALARA). In such cases, criticality safety reviews will be conducted and controls implemented in accordance with the applicable requirements of the DOE-approved Site Nuclear Criticality Safety Manual.

Activity-specific IWCP work packages will be prepared for each project, containing step-by-step instructions for all ventilation and filtration system removal work. Work instructions will be based on project-specific hazard analyses and hazard controls. In addition, proposed activities will be reviewed by the various environmental management SMEs (e.g., air quality, water quality). Doses to workers and the public will be calculated, controls will be implemented to meet the applicable regulatory standards (e.g., 40 CFR 61, Subpart H, and Colorado Air Quality Control Commission Regulation No. 8), and environmental monitoring will be conducted, as required.

5.4.7 Removal of Contaminated Portions of the Building Shell

It is the intent of DOE and its contractor to decontaminate all contaminated portions of the building shell (i.e., walls, floors, ceilings, roofs, and other structural members) to meet the applicable criteria for unrestricted release demolition in accordance with the RSOP for Facility Disposition. However, in the event the material disposition analysis shows that decontamination will pose a significant risk to workers and/or public health and safety and the environment, or decontamination is not economically feasible, the contaminated section of the shell will be removed prior to demolition. In such cases, the shell will not be breached unless the area immediately behind it meets the unrestricted release criteria (see Table 4).

The following paragraphs describe the requirements for performing these removal activities in preparation for facility demolition. Activity-specific IWCP work packages will be prepared for each project, containing step-by-step instructions for all removal work. Work instructions will be based on project-specific hazard analyses and hazard controls. As discussed in Section 2.3, the LRA will have a standing invitation to all IWCP planning meetings and associated roundtable review sessions. Shell removal activities will also be discussed as the periodic project status briefings (e.g., the "Pizza Meetings").

5.4.7.1 Prerequisites for Removing Contaminated Portions of the Building Shell

As described below, six analyses will be conducted in preparation for the removal of a contaminated portion of the building shell.

- **Relative Costs**: First, the Building 707 Closure Project Manager will consider relative costs in accordance with Section 5.4.2 of this DOP. If it is not feasible to decontaminate the member (e.g., the entire structural member is contaminated and it cannot be decontaminated without destroying it), this analysis will not be required; however, the unique circumstances will be documented in the Project Record.

- **Structural Evaluation**: Second, a structural evaluation will be performed to identify the engineering controls required to allow for the safe removal of the contaminated member (e.g., shoring, installation of temporary supports, use of a crane or boom truck). This engineering evaluation will be certified by a Colorado registered professional engineer.
- **Radionuclide Emissions**: A third analysis will be conducted to assess the potential for emissions of radionuclides to the environment, and to ensure compliance with the applicable air quality requirements.[35] This analysis will be performed by a Site air quality SME, pursuant to air quality management program requirements, which include characterizing the nature and extent of contamination, calculating related emissions to the atmosphere, calculating resultant doses to the public, and comparing estimated doses to the applicable regulatory limits. Emission controls will be identified and, if warranted, an Enhanced Air Monitoring Plan will be developed to augment the Site-wide monitoring network and provide for continuous monitoring of emissions from the removal activity.[36]
- **Dust Generation**: A fourth analysis will be performed by a Site air quality SME to assess the potential for dust generation and to establish required controls in accordance with the contractor-approved Air Quality Management Plan.
- **Impacts to Surface Water**: A fifth analysis will be performed by a Site water quality SME to assess potential impacts to surface water and to establish required controls in accordance with the contractor-approved Site Water Management Plan and the Site Integrated Monitoring Plan.
- **Impacts to Migratory Birds**: Finally, a survey will be conducted to ensure the planned removal activities will not impact migratory birds or their nests. Migratory birds are protected by the Migratory Bird Treaty Act[37] and the Wildlife Conservation Act[38], which prohibit the removal or destruction of bird nests without a permit from the U. S. Fish and Wildlife Service. As a result, during the early stages of project planning and scheduling, the closure project team will work with a Site ecologist to take preventive measures to discourage nesting or to obtain the required nest removal permit(s).

5.4.7.2 Shell Removal Sequence

Typically, removal of a contaminated portion of the building shell will proceed as described below. Project-specific requirements, including ES&H controls, will be described in the applicable IWCP work packages and/or other work control document(s).

- Surveys will be performed to identify the boundaries of contamination and to develop a safety margin around the contaminated area. A safety margin is a boundary outlined around the contaminated area, up to the point where mechanical removal methods may be used prior to initiating cutting techniques.
- The contaminated member will be removed using one of the removal techniques described in Section 5.4 of this DOP.
- Emissions from the removal activity will be controlled by shielding the contaminated member from the environment (e.g., a fixative may be applied to the contaminated member, the exposed

[35] National Emission Standards for the Emissions of Radionuclides Other Than Radon From Department of Energy Facilities, 40 CFR 61, Subpart H, and Colorado Air Quality Control Commission Regulation No. 8.

[36] Enhanced monitoring is discussed in Section 4 the Site Integrated Monitoring Plan (latest revision).

[37] Migratory Bird Treaty Act, 16 USC 701 *et seq*.

[38] Fish and Wildlife Conservation Act, 16 USC 661 *et seq*.

sections of the member may be wrapped in plastic sheeting, a tent may be erected around the member, and/or a wind wall may be constructed to shield the member). Fugitive dust will be controlled by loading facility debris into covered containers, applying water in a controlled manner, and/or terminating removal activities during periods of high wind.[39]

- The area around the contaminated member will be inspected to identify potential pathways for migration of contaminants, including floor drains, cracks, seams, and floor/wall intersections. Pathways may be isolated by covering or filling (e.g., plastic sheeting or grout). Surface water will be controlled using standard construction methods, including silt fences, hay bales, and diversion ditches (see Appendix B for details). Water from dust control and/or cutting activities will be managed as incidental waters in accordance with the RFETS procedure for the control and disposition of incidental waters.[40] Surface water monitoring will be conducted in accordance with Site Water Management Plan[41] and the Site Integrated Monitoring Plan.[42] Additional performance monitoring stations will be installed, as necessary, based on activity-specific assessments performed by Site water quality SMEs.
- Air monitoring will be performed in accordance with the requirements of the Site Air Quality Management Program Plan[43] and the Enhanced Air Monitoring Plan (if applicable). The existing RFETS Radioactive Ambient Air Monitoring Program (RAAMP) sampler network will be used for ambient air monitoring during removal activities. The RAAMP sampler network continuously monitors airborne dispersion of radioactive materials from the Site into the surrounding environment. Thirty-seven samplers comprise the RAAMP network. Fourteen of these samplers are deployed at the Site perimeter and are used to confirm Site compliance with the 10 millirem (mrem) dose standard mandated in 40 CFR 61, Subpart H. Filters from the 14 perimeter RAAMP samplers and from one on-Site sampler near the 903 Pad are collected and analyzed monthly for uranium, plutonium, and americium isotopes. In addition to the perimeter network, enhanced radionuclide ambient air sampling will be performed on an as-needed basis using RAAMP samplers in the immediate vicinity of the individual removal activities.

5.5 Facility Demolition

The demolition phase of decommissioning includes removal of the building shell, slab, foundation or facility footing to a depth at least three feet below ground surface. The soil beneath the facility is not within the scope of this DOP. It will be addressed during the environmental restoration (ER) phase of the Building 707 Closure Project.

5.5.1 Pre-Demolition Survey

Prior to facility demolition, a pre-demolition survey (PDS) will be conducted to verify the nature and extent of radiological and chemical contamination in the facility. The survey will be conducted in accordance with DDCP. The characterization process will incorporate the following steps:

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39 At RFETS, the high wind threshold is typically 30 mph (sustained), as prescribed by the Site Shift Superintendent.

40 Control and Disposition of Incidental Waters (1-C91-EPR-SW.01), (latest revision).

41 Rocky Flats Environmental Technology Site Water Management Program Plan (MAN-080-EM-SWMP), (latest revision).

42 Site Integrated Monitoring Plan Background Document, FY2000, September 1999.

43 Rocky Flats Environmental Technology Site, Air Quality Management Program Plan (MAN-080-EMPM-AIR), (latest revision).

- The Building 707 Closure Project team will develop characterization packages for taking final measurements and samples.
- DOE and the LRA will review the sampling results.
- DOE will request an independent verification of the characterization data.
- The LRA, at its discretion, will review the results from the independent verification.
- During the characterization process, the LRA will have access to facilities to collect samples or measurements, at its discretion.

5.5.2 Demolition Planning and Execution

Demolition activities will be planned at an appropriate time in the closure process, prior to completion of the pre-demolition survey. Actual demolition will not proceed until the LRA has concurred with the Pre-Demolition Survey Report (PDSR) and stakeholders have been notified of the demolition schedule and techniques to be used to demolish the facility. A qualified, experienced demolition contractor will perform the necessary demolition activities within the Building 707 Cluster, and a Colorado registered professional structural engineer and certified safety professional will continuously monitor demolition activities to ensure they are conducted safely. The qualification requirements for the contractor will be documented in the scope of work. The demolition contractor will prepare a Demolition Plan prior to initiating demolition activities. The Demolition Plan will be prepared in accordance with Occupational Safety and Health Act (OSHA) §1926, Subpart T, and will detail the methods to be used to collapse the facility. At a minimum, the Demolition Plan will contain the following information:

- An engineered survey of the structure that determines the condition of the framing, floors, and walls;
- Shoring and bracing requirements and information for facilities that have been damaged by fire, flood, explosion, or other cause;
- Water run-on and run-off control, dust suppression, and air monitoring requirements;
- Shut-off, capping, and control measures for all electric, gas, water, steam, sewer, and other service lines;
- Temporary relocation and/or protection for any utilities that need to be maintained through demolition activities;
- Elimination or control of any remaining hazardous chemicals, gases, explosives, flammable materials, or dangerous substances;
- Removal of glass and implementation of fall protection in areas where falling through a wall opening taller than 42 inches will be possible;
- Cordoning off areas where material will be dropped without a chute with barricades not less than 42 inches high and not less than six feet back from the protected edge of the opening;
- Covering of all floor openings with material substantial enough to support the weight of any reasonably expected load;
- The sequence of demolition activities, which will generally start from the top of the structure and proceed downward. The exterior walls of the top stories will be dropped before the exterior wall on the lower floors. Exceptions can be made for cutting holes in floors for chutes, holes for dropping materials, and preparation of storage space; and

- Protection of employee entrances with sidewalk sheds and canopies providing a minimum of 8 feet from the face of the facility and at least two feet wider than the facility entrance.

5.5.3 Demolition Techniques, Hazards, Controls, and Monitoring

Facility demolition will involve large mechanical equipment, which may include wrecking ball or crane; excavators equipped with a hydraulic hoe-ram and grapple; and/or front-end loaders, which will be used to demolish, size reduce, segregate, and load the concrete, steel and other facility materials into waste containers or stockpiles. The primary demolition steps and mechanical techniques for dismantling, segmenting, and demolishing will be provided in activity-specific IWCP work packages. The following paragraphs describe the demolition equipment. The equipment manufacturer and/or supplier operations and maintenance requirements will be followed. The Demolition Plan will indicate which methods will be used during demolition activities and the IWCP work packages will detail the methods. Figure 12 illustrates the demolition method(s) selection process.

5.5.3.1 Wrecking Ball

A wrecking ball is generally used for demolishing non-reinforced or lightly reinforced concrete structures less than three feet thick. The equipment consists of a 2- to 5- ton ball suspended from a crane boom. The industry standard method of use is to raise the ball with a crane between 10 to 20 feet above the structure and release the cable brake, allowing the ball to drop onto the target surface. This method achieves good fragmentation of the structure, maintains maximum control of the ball after impact, and maintains control of the debris by dropping the debris within the footprint of the facility. The wrecking ball is recommended for non-radioactive concrete structures because the release of dust is difficult to control. Dust suppression methods are discussed in Section 5.5.6.

5.5.3.2 Excavator Mounted Attachments

Excavator mounted attachments are industry standard for a wide variety of demolition projects, and provide controlled demolition. Controlled demolition means various attachments mounted to an excavator are used to methodically disassemble a structure. The basic attachments to an excavator include concrete pulverizers, shears, grapples, and rams. The attachments perform the following functions:

- Pulverizers crush concrete and separates rebar and encased steel beams.
- Shears sever metals, structural steel, wood, rubber, and plastic.
- Grapples serve as an all-purpose tool for demolition and material handling.
- Rams demolish concrete structures up to six feet thick with a moil or chisel point.

Concrete pulverizer jaws are capable of separating rebar and embedded steel beams from concrete. Plate shears are used for clean cutting steel plate up to 1¼ inches thick. The plate shears are more applicable to decommissioning and can be used to dismantle above and below ground tanks and to cut separated rebar.

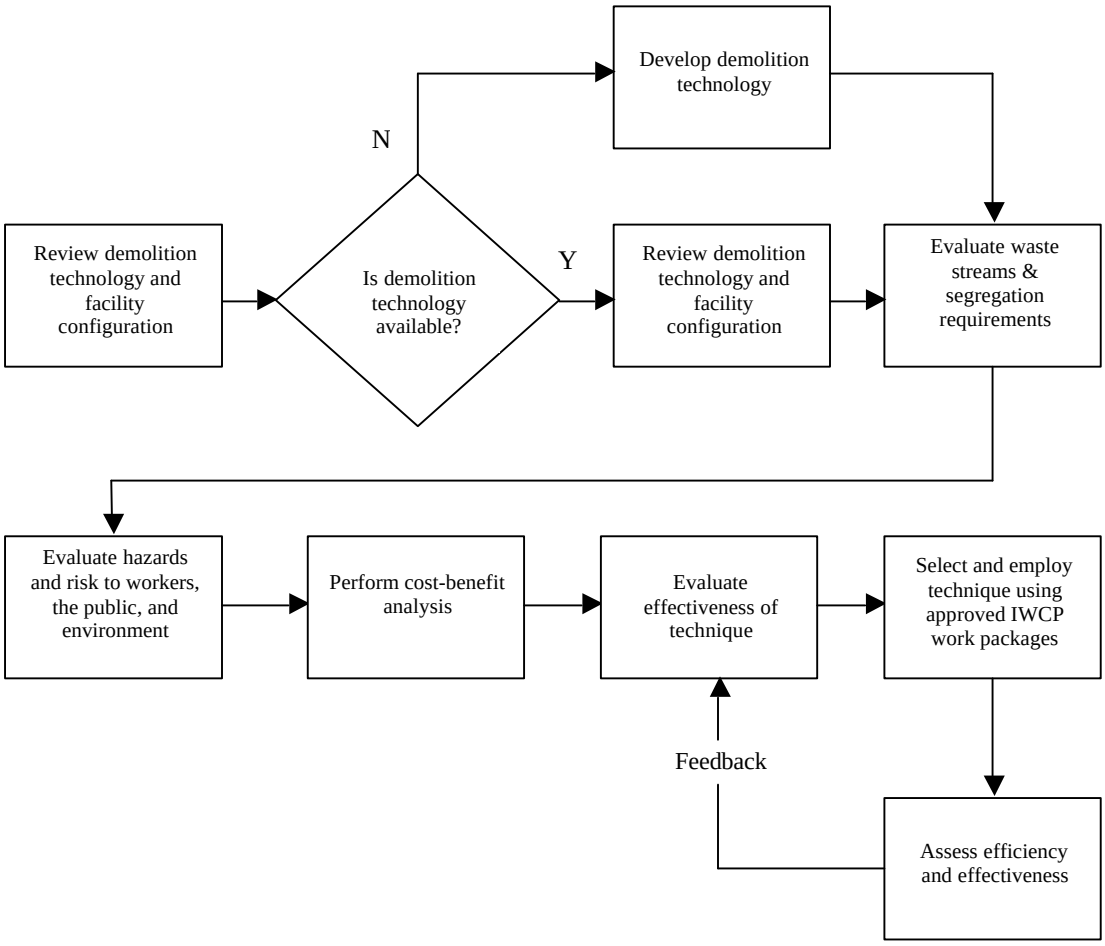

Figure 12. Demolition Method Selection Process

Grapples are versatile and provide a wide range of uses including demolition, scrap recycling, and material handling. Grapples may be used as an alternative to loaders and buckets as a tool for demolition cleanup.

The ram is a resistance driven tool that begins operating as soon as the chisel point touches the work piece and stops as soon as the chisel is lifted or clear the work piece. Air powered rams are used for lightly reinforced concrete that is less that two feet thick. Hydraulic rams can be used for demolition of much larger sections of concrete, up to six feet thick, and are available with heads capable of delivering approximately 7,000 to 10,000 foot pounds of energy per blow.

5.5.3.3 Diamond Wire Cutting

Diamond wire cutting involves a series of guide pulleys that draw a loop of multi strand wire strung with a series of diamond beads and spacers through a cut. The required length of the wire is obtained by assembling standard length sections of wire end-to-end using screwed sleeves. A contact tension is kept on the wire, and this force with the spinning wire cuts a path through concrete and rebar. Linear wire speed is adjustable from approximately 0 to 5,900 feet per minute, and wire tension can be adjusted from approximately 1 to 330 pounds. The wire is wrapped around the object to be cut and tension is applied. If an internal cut is required, drilling is necessary to allow the wire too be fed through the holes. Concrete of almost any thickness can be cut with this technique.

A benefit of the wire cutting is the flexibility of the pulley system, which allows cutting at unusual configurations. This flexibility also allows easy and safe cutting in areas with restricted access and remote cutting in hazardous and radioactive environments.

5.5.3.4 Cabling

Cabling involves the use of a large cable and one or more bulldozers. A cable is sized so that it will fit around the facility and withstand the pressure of bulldozer and the facility weight. The cable is wrapped around the facility and attached to one or more bulldozers. The bulldozer size and number is dependent on the size of the facility. The bulldozers apply tension to the cable until the facility collapses.

5.5.3.5 Non-Explosive Cracking Agent

A non-explosive cracking agent is a chemical that may be used to fracture concrete. The cracking agent is a powder, liquid, or putty that is mixed with water and poured into holes, as it hardens, it exerts pressures up to approximately 12,000 psi, which fractures the concrete. The cracking agent does not work instantly; it often takes up to 12 hours to fracture the concrete.

There are several types of non-explosive cracking agent and each manufacturer will have a specific method for using the agent. Generally, several holes are drilled in the area to be fractured. The hole diameter and depth must be sized according to manufacturer's recommendation, but are generally not larger than 1½ inches in diameter or 10 feet in depth.

Non-explosive cracking agents are generally not cost effective in slabs less than five inches. Non-explosive cracking agents can be used in combination with other methods. The cracking agent will produce cracks, and an excavator with attachments can complete the demolition activity. If non-explosive cracking agents are used, the IWCP work package will include the manufacturer's recommendations, a step-by-step procedure, Material Safety Data Sheets (MSDSs), and checklist for using the cracking agent.

5.5.3.6 Explosives

The use of explosives for the demolition of facilities will require extensive planning using the Demolition Plan and IWCP work packages. A subcontractor specializing in controlled demolition through the use of explosive materials will be selected. The Demolition Plan will outline the detailed steps involved in the activity, including the test shot, type, and placement of explosive material, and the shot sequence. The IWCP work package will contain checklists that verify the steps required before, during, and after placement of the explosive materials, and the safety measures employed to ensure worker health and safety.

A walkthrough of the facility will be conducted with the explosives subcontractor and appropriate Site personnel. During this time, original structural drawings will be reviewed and core samples will be collected. The samples will be used in calculations to determine the type and quantity of explosive materials required. A test shot will be conducted to verify the calculations. The test shot will involve setting and activating the proposed explosive material on a non-structural portion of the facility to verify the concrete fracturing.

The use of explosives will require an evaluation of the health and safety and economic benefits and will involve regulatory input as well as technical input from SMEs in the explosives field. Due to the age and condition of some of the facilities in the 707 Cluster, the use of explosives may be the only safe method of demolition. The safety and economic evaluation will be documented and included in the Project's AR File, along with the qualifications of the selected subcontractor. Prior to any demolition activity involving the use of explosives, the Building 707 Closure Project Manager will conduct a public briefing, which will include a detailed description of the planned activity, methods to be used, and scheduled date(s).

5.5.3.7 ES&H Controls and Monitoring

Demolition activities present hazards to workers and the environment. Table 14 summarizes the hazards and controls associated with each of the demolition techniques described in this section. Environmental impacts will be minimized using procedures designed to prevent uncontrolled release of waste, to control water run-on and run-off, and to minimize fugitive dust emissions. The environmental protection procedures will be detailed in the Demolition Plan.

5.5.3.7.1 Air Emissions Control

In accordance with CAQCC, Regulation 1, the demolition contractor will prepare a Dust Control Plan prior to initiation demolition activities. The Dust Control Plan will describe the specific methods that will be used to control fugitive dust during demolition activities. As appropriate for the each activity, dust suppression methods may include the following actions:

- A controlled water spray may be used to minimize fugitive dust emissions without resulting in excess ponding or run-off. Depending on the facility location, a water truck or hydrant will be used.
- Facility debris may be loaded into waste roll-off containers that will be covered to control fugitive dust emissions.
- Roads may be periodically cleaned with a street sweeper.

Table 14. Demolition Hazards and Controls

Demolition Technique	Associated Hazards	Hazard Controls	Comments
Wrecking ball	Bodily injury due to flying/falling objects; hearing impairment; eye hazard.	Training on job-specific hazards, related procedures, PPE, and the proper use of equipment. Inspection of equipment prior to use. Implementation of Dust Control Plan.	Air monitoring will be performed.
Excavator mounted attachments	Bodily injury due to flying/falling objects; hearing impairment; eye hazard.	Training on job-specific hazards, related procedures, PPE, and the proper use of equipment. Inspection of equipment prior to use. Implementation of Dust Control Plan.	Air monitoring will be performed.
Diamond wire cutting	Bodily injury due to flying objects if wire breaks; hearing impairment; eye hazard.	Training on job-specific hazards, related procedures, PPE, and the proper use of equipment. Inspection of equipment prior to use. Implementation of Dust Control Plan.	Air monitoring will be performed.
Cabling	Bodily injury; hearing impairment; eye hazard.	Training on job-specific hazards, related procedures, PPE, and the proper use of equipment. Inspection of equipment prior to use. Implementation of Dust Control Plan.	Air monitoring will be performed.
Non-explosive cracking agents	Bodily injury, eye hazard (i.e., drilling required to create holes into which cracking agent is introduced).	Training on job-specific hazards, related procedures, PPE, and the proper use of equipment. Inspection of equipment prior to use. Implementation of Dust Control Plan.	Air monitoring will be performed.
Explosives	Bodily injury, eye hazard.	Training on job-specific hazards, related procedures, PPE, and the proper use of equipment. Inspection of equipment prior to use. Implementation of Dust Control Plan.	Air monitoring will be performed.

- Dust control devices or shrouds may be used on individual pieces of equipment.
- Fixatives may be applied to concrete stockpiles to minimize dust.
- Demolition activities will be suspended by the Site's Shift Superintendent during periods of high wind (typically 30 mph [sustained]).

In addition, the existing Site Radioactive Ambient Air Monitoring Program (RAAMP) sampler network will be used for ambient air monitoring during demolition. The RAAMP sampler network continuously monitors airborne dispersion of radioactive materials from the Site into the surrounding environment. Thirty-seven samplers comprise the RAAMP network. Fourteen of these samplers are deployed at the Site perimeter and are used to confirm Site compliance with the 10 mrem standard mandated in 40 CFR 61, Subpart H.

Filters from the 14 perimeter RAAMP samplers and from one on-Site sampler near the 903 Pad are collected and analyzed monthly for uranium, plutonium, and americium isotopes. In addition to the perimeter network, enhanced radionuclide ambient air sampling will be performed on an as-needed basis utilizing RAAMP samplers in the immediate vicinities of the individual demolition projects. The emissions results from all facility demolition activities will be compiled and submitted annually for incorporation into the RFETS Monitoring Report.

5.5.3.7.2 Soil Disturbance Permit

Prior to the demolition of any building within the 707 Cluster, the demolition contractor will complete a Soil Disturbance Evaluation Form, which will identify the location of underground utilities (i.e., sewer, process waste, storm drain, telephone, water, fuel, and electric lines), as well as any known environmental, waste, radiological, and/or safety hazards. When completed, the Soil Disturbance Evaluation Form will be reviewed by a Site excavation specialist, who will coordinate the review and approval of the demolition work with the appropriate organizations. Soil disturbance activities will not be performed until the excavation specialist has provided written approval for the work to proceed. [44]

5.5.3.7.3 Demolition Permit

Prior to the demolition of any building within the 707 Cluster, the demolition contractor will prepare and submit a Demolition Notification to CDPHE for review and approval in accordance with CAQCC Regulation No. 8, Part B. Demolition activities will not be performed until CDPHE has provided written approval for the work to proceed.

5.5.3.7.4 Migratory Bird Clearance

Prior to the demolition of any building within the 707 Cluster, a survey will be conducted by an ecology SME to ensure the planned demolition activities will not impact migratory birds or their nests. This inspection is for nesting birds in and around facilities prepared for demolition.

5.5.3.7.5 Surface Water Management

During demolition, surface water will be controlled using standard construction methods, including silt fences, hay bales, and diversion ditches (see Appendix B for details). Water from dust control and/or cutting activities will be managed as incidental waters in accordance with the RFETS procedure for the

[44] Soil disturbance requirements are contained in Chapter 45 of the RFETS Occupational Safety & Industrial Hygiene Program Manual, entitled "Excavation and Trenching."

control and disposition of incidental waters.[45] Surface water monitoring will be conducted in accordance with Site Water Management Plan[46] and the Site Integrated Monitoring Plan.[47] Additional performance monitoring stations will be installed, as necessary, based on activity-specific assessments performed by Site water quality SME.

5.5.3.7.6 Groundwater Management

The Sampling and Analysis Plan (SAP) for Decontamination & Decommissioning Groundwater Monitoring of Buildings 371/374, 707, and 776/777[48] describes the well installation, well development, and initial groundwater sampling activities planned for the Building 707 Cluster during decommissioning. The general philosophy of the decommissioning groundwater monitoring program is to install new monitoring wells before decommissioning activities begin, analyze sample results to create a pre-decommissioning baseline, and continue to draw samples semi-annually for approximately five years after buildings in the 707 Cluster have been demolished. Additional groundwater samples will be collected over the long term, in accordance with the Site's Integrated Monitoring Plan.

Building 707 is located near the east edge of the Industrial Area volatile organic compound (VOC) plume. Four monitoring wells have been installed upgradient, and one has been installed downgradient of Building 707, with two additional downgradient wells planned for the near future. Preliminary sample results from the existing wells show concentrations of tetrachloroethene in one of the upgradient wells (100 µg/l) and in the downgradient well (5 µg/l), suggesting that the Industrial Area VOC plume extends to these locations. Nitrates and radiological contamination do not appear to be significant along the groundwater flow path. These pre-existing conditions will be factored into future evaluations of water quality impacts in the vicinity of the Building 707 Closure Project.

Detailed analysis of groundwater flow patters in the vicinity of Building 707 is prohibited due to a lack of sufficient well control near the building. However, available data indicate a broad, northeast trending area of relatively flat groundwater gradient dominates the flow field in this area.

In the event groundwater is encountered during facility demolition, it will be removed, as necessary to characterize and remediate the interior surfaces of the building, specifically the basement, vaults, sumps and/or pits. ER personnel will collect samples to characterize the groundwater. If the groundwater is contaminated, ER personnel will determine if the groundwater could impact surface water. If the water is contaminated, but there is no threat to surface water protection standards, the groundwater will be left in the subsurface structure with appropriate controls to protect the health and safety of workers and the public until remediation during ER. If the water is contaminated and is a threat to surface water protection standards, the water will be pumped to a treatment facility until remediated during ER. Table 15 provides some potential scenarios with respect to groundwater and surface water actions during decommissioning. This table presents examples of potential conditions and actions to be taken. Project-specific controls will be detailed in the Demolition Plan and IWCP work package for the demolition activity. ER actions, details, and requirements will be detailed in the ER RSOP.

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[45] Control and Disposition of Incidental Waters (1-C91-EPR-SW.01), (latest revision).

[46] Rocky Flats Environmental Technology Site Water Management Program Plan (MAN-080-EM-SWMP), (latest revision).

[47] Site Integrated Monitoring Plan Background Document, FY2000, September 1999.

[48] Sampling and Analysis Plan (SAP) for D&D Groundwater Monitoring of Buildings 371/374, 707 and 776/777 (latest revision).

Table 15. Groundwater and Surface Water Conditions and Associated Actions

Condition	Action
Groundwater, surface water, utility water and/or precipitation is collecting in the excavation area or in below-ground structures (e.g., the basement, or in "C" Pit) and it must be removed to (1) ensure safe work areas and protection of the environment, and/or (2) characterize and remediate interior building surfaces.	As required, temporarily manage as "incidental waters" during decommissioning activities.
Prior to decommissioning activities, water is collecting in sumps, vaults, or other below ground structures and pumped to Site treatment facilities.	This water will continue to be collected and treated at Building 374 or other Site facilities as required to protect surface water and to maintain appropriate work environments until decommissioning is completed and/or until ER work is completed as required.
Prior to decommissioning activities, water is collecting in sumps, vaults, or other below ground structures but is not pumped or treated.	Water will not be collected, removed, or treated unless required to protect worker safety, protect surface water quality, and/or to perform decommissioning activities.
There are potential surface water impacts from foundation drains	Sanitary drains, foundation drains, sewer lines, and other similar pathways to the Site sewage treatment plant and surface water drainages will be isolated during decommissioning activities that generate liquids or other mobile forms of contamination to prevent the contamination from being released through these pathways. The pathway to surface water from foundation drains will be removed during ER, either through drain removal, grouting or other effective mechanism unless these are disturbed during decommissioning. In that case, the foundation drains will be removed during decommissioning.
Potential future surface water impacts from decommissioning activities	Pathways to surface water from decommissioning activities will be monitored by the Site water management program, as required by the Integrated Monitoring Plan.

5.6 Interfaces with Environmental Restoration

Decommissioning activities will be coordinated with ER activities to achieve an integrated process that minimizes risk to workers and the environment, minimizes generation of remediation wastes, streamlines technical processes, and reduces project costs. Project interface points will be as follows:

- Generally, the ER schedule will be integrated with the decommissioning schedule to allow for the planning and initiation of ER characterization activities during facility decommissioning.
- If possible, the subcontractor with primary responsibility for facility demolition will also conduct the necessary ER activities. Demolition and ER activities will proceed as an uninterrupted two-phase operation culminating in closeout of the associated Individual Hazardous Substance Sites (IHSSs), Potential Areas of Concern (PACs) and Under Building Contamination (UBC).

- During decommissioning:
  - Electrical and water lines will be removed. Underground utility lines located outside the facility footprint will be left in a stable condition. A map showing the locations and sources of these utility lines will be maintained in the Building 707 Closure Project files and provided to the ER organization.
  - Process waste lines, tanks, and other lines associated with the process waste transfer system (i.e., the "new" process waste lines) and any "old" process waste lines will be removed and/or isolated at the facility perimeter. A map, showing the locations and sources of the process waste lines will be maintained in the Building 707 Closure Project Files and provided to the ER organization.
  - Sanitary sewer lines, tanks, and ancillary equipment will be flushed with clean water and removed to the nearest isolation valve.
  - Structural material within three feet of the proposed final grade will be removed, including building slabs and foundations, unless otherwise required due to ER remediation requirements.
  - Structures below three feet of the proposed final grade will be removed when the structure prevents access to underlying soil that requires remediation, or when the structure does not meet the applicable unrestricted release criteria (see Table 4). Removal activities will include removal of the foundation and at least three feet of the associated footings/pilings. Any remaining footings/pilings will be assessed and removed (if required) during ER.
- During ER:
  - Sidewalks, driveways, and roads outside the facility footprint will be removed.
  - Process waste lines located beneath floor slabs will be removed, along with associated contaminated soil.
  - If necessary, underground utility lines located outside the facility footprint will be removed.
  - Structures remaining after removal to below three feet of the proposed final grade will be addressed (i.e., they will be left in place if uncontaminated; removed if contaminated).
  - The effects of remaining subsurface structures (e.g., utility and pipeline corridors, building slabs, foundations, drains) will be evaluated and reported in the Site Water Balance Study.
  - The Industrial Area groundwater plume will be evaluated and remediated.

In the event there is a gap between decommissioning and ER, the Site's landlord organization will provide surveillance and maintenance of the facility slab. The hand-off from decommissioning to the landlord organization will be documented in writing, by the decommissioning, ER, and landlord organizations.

6.0 WASTE MANAGEMENT

Various waste types will be generated as a result of decommissioning activities within the Building 707 Cluster. Waste estimates for these and other RFETS Closure Project activities are reported in the "Waste Generation, Inventory, and Shipping Forecast," which includes projections for waste volumes to be generated, stored, and shipped from the Site in each fiscal year. As the Project progresses, waste volume estimates will be refined and updated on a quarterly basis, or more frequently if warranted by significant changes. This section of the DOP describes how the various wastes will be managed as facility components are removed, size-reduced, and decontaminated in preparation for the demolition phase of decommissioning.

6.1 Process Waste Versus Remediation Waste

Wastes generated as a result of facility decommissioning will be accumulated, staged, stored, and treated in compliance with applicable laws, regulations, and requirements. When determining the appropriate waste management requirements, an important distinction exists between wastes designated as "process" waste and those designated as "remediation" waste.

Process waste in includes:

- Mixed residues;
- Liquids, sludges, and oils in tanks and ancillary equipment;
- Containerized waste generated prior to approval of this DOP; and
- Liquid waste chemicals (no matter when generated).

Remediation waste includes:

- Waste generated from decommissioning activities performed under this DOP,
- Solid waste chemicals (no matter when generated),
- Residual liquids or sludges remaining in "RCRA stable" or "physically empty" tanks.

6.1.1 Management Requirements for Process Waste

Hazardous and mixed wastes designated as "process" waste will continue to be managed in compliance with both the substantive and administrative requirements of RCRA, CHWA, CHWR, and the Site's RCRA Part B Permit.

6.1.2 Management Requirements for Remediation Waste

Hazardous and mixed wastes designated as "remediation" waste will be managed in accordance with the ARARs presented in Section 4.0 of this DOP, and with the remediation waste management requirements described in a Building 707 Operations Order, which will be prepared prior to the initiation of decommissioning activities.

6.2 Waste Types

As discussed in Section 3.0 of this DOP, facilities within the Building 707 Cluster were designed and constructed in the early 1970s to replace the manufacturing processes originally performed in Building 776/777, including casting, forming, metallurgy, machining, assembly, inspection and non-destructive

testing of plutonium parts, and associated support services. As a result, a variety of regulated wastes and recyclable materials are currently managed and stored in Building 707, and additional waste will be generated during decommissioning. Table 16 provides an estimate of the types and volumes of remediation waste and recyclable materials that will be generated during decommissioning. The remainder of the section provides a brief description of each waste type.

6.2.1 Hazardous Waste

Hazardous waste contains hazardous constituents or exhibits hazardous characteristics as defined by RCRA, CHWA, and the Colorado Hazardous Waste Regulations (CHWR). A variety of hazardous wastes may be generated during decommissioning, including metals, organics, combustibles, and hazardous liquids. Hazardous waste is routinely shipped to off-Site commercial facilities for treatment, and/or disposal.

6.2.2 Radioactive Waste

Radioactive wastes have been generated in the Building 707 Cluster as a result of operations in areas where radioactive materials are or were formerly managed. A variety of radioactive waste forms are expected from facility component removal, size reduction, and decontamination activities, including metals, organics, combustibles, and liquids. Radioactive waste is categorized as transuranic (TRU) or low-level (LL), depending on the concentration of alpha-emitting radionuclides present in the waste.

6.2.2.1 Transuranic Waste

TRU waste is defined as any waste contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years, in concentrations greater than or equal to 100 nanocuries per gram (nCi/g). TRU wastes will be generated during the removal of gloveboxes and B-boxes used in the fabrication, testing, assembly, coating, and disassembly of weapons components, and during the removal of Zone 1 ventilation/filtration systems.

Although most building tank systems will be drained during deactivation, some TRU waste liquids may be generated when residual liquids are removed from equipment, tanks, and ancillary piping during decommissioning. Liquid TRU waste will require treatment prior to disposal. TRU waste is destined for disposal at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, NM.

6.2.2.2 Low-Level Waste

LL waste is defined as any radioactive waste not classified as TRU waste, high level waste, or spent nuclear fuel. The concentration of alpha-emitting radionuclides in LL waste is less than 100 nCi/g, with no specified minimum level of activity. LL waste forms expected from facility component removal, size reduction, and decontamination activities include debris, combustibles, light metals, and liquids. LL waste is routinely shipped to the Nevada Test Site (NTS) for disposal.

Table 16. Waste/Recyclable Material Estimates

Category	Sub-Category	Volume*	Proposed Destination
Rad-Regulated			
Transuranic (TRU)	TRU	1,045 m^3	Waste Isolation Pilot Plan (WIPP)
	TRU Mixed (TRM)	199 m^3	WIPP
	Residues	2 m^3	WIPP
	TRU/TRM Liquids	< 1 m^3	N/A
Low-Level (LL)	LL - Including Asbestos	2,028 m^3	TSD$^{\Phi}$
	LL - Structural Debris	2,291 m^3	TSD$^{\Phi}$
	LL - Surface Contaminated Objects (SCO)	9,987 m^3	TSD$^{\Phi}$
	LL - Contaminated Recycle Metal	<1 m^3	N/A
	LL - Liquids	<1 m^3	N/A
	LL - PCBs	1 m^3	TSD$^{\Phi}$
Low-Level Mixed (LLM)	LLM - RCRA solids	81 m^3	TSD$^{\Phi,\oplus}$
	LLM - RCRA liquids	2 m^3	TSD$^{\Phi,\oplus}$
Non-Rad Regulated			
Hazardous/Toxic	RCRA	4 m^3	TSD$^{\Phi}$
	CERCLA	<1 m^3	TSD$^{\Phi}$
	PCBs	7 m^3	TSD$^{\Phi}$
	Friable Asbestos	12 m^3	TSD$^{\Phi}$
	RCRA/CERCLA Liquids	<1 m^3	TSD$^{\Phi}$
Sanitary	Routine Sanitary	<1 ton	Sanitary landfill
	Non-Routine Sanitary	6,058 tons	Sanitary landfill
	Rubble/Structural Construction Debris	<1 ton	N/A
	Non-Friable Asbestos	23 tons	Sanitary landfill
Material for Recycle	Salvage/PU&D	<1 m^3	Vendor
	Rubble/Structural Construction Debris	55,201 tons	Recycled on Site
	Radiolological Test/Calibration Sources	<1 m^3	N/A
	Non-Construction Scrap Metal/Recycle	<1 m^3	N/A

* Waste estimates are based on best available information. This table is for information purposes only and will not be revised as estimates are updated. Waste estimates include demolished structures.

Φ The RFETS Environmental Home Page (http://rfetshp/environmental/) contains a list of currently authorized TSDs. TSDs are selected by the contractor based on periodic environmental audits, which are conducted in accordance with the Off-Site Waste Management Program (1-MAN-037-OWMP, latest revision) and documented in Off-Site Waste Management Facility Use Decisions (FUDs).

⊕ Assumed to include on-Site treatment facilities (e.g., RCRA Unit 374.3).

6.2.3 Mixed Waste

Mixed waste contains both radioactive and hazardous constituents. These wastes will be managed in accordance with the applicable radioactive waste and hazardous waste requirements.

6.2.3.1 Transuranic Mixed Waste

TRM waste is TRU waste with a hazardous waste constituent or characteristic. TRM waste types expected are the same as described above in Section 6.2.2.1 for TRU waste. TRM waste is destined for disposal at WIPP. TRM liquids (i.e., sludges and oils) will require treatment prior to shipment.

6.2.3.2 Low-Level Mixed Waste

LLM waste is LL waste with a hazardous waste constituent or characteristic. LLM waste types expected are the same as described above for LL waste in Section 6.2.2.2. Solid LLM waste is planned for disposal at Envirocare or other off-Site TSD facility. LLM wastewater may be transferred to Building 374 or other on-Site treatment unit, as described in Section 6.2.8. LLM process and remediation wastes that do not have a current treatment and/or disposal path will be managed under the Site Treatment Plan (STP).[49] STP wastes may include sludges from waste tanks, equipment oils, waste chemicals, and solids (e.g., lead shielding, leaded glass, printed circuit boards). As treatment paths and associated timetables are identified for these wastes, they will be identified period updates to the STP.

6.2.4 Waste Containing Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) may be found in equipment oils, fluorescent light ballasts, applied dried paints, plastics (e.g., wire insulation; radio, television, and computer casings; vehicle parts, and furniture laminates), pre-formed or molded rubber parts, and capacitors.

Equipment oils containing PCBs will be managed as "PCB liquids"; solid waste containing PCBs (e.g., light ballasts, applied dry paints) will be managed as "PCB bulk product waste"; and capacitors containing PCBs will be managed as "PCB items." PCB waste will be packaged and transferred to on-Site storage pending shipment to an off-Site treatment and/or disposal facility.

6.2.5 Sanitary Waste

Sanitary waste is classified as routine (e.g., normal office trash), (2) non-routine (e.g., construction debris), and (3) special (e.g., petroleum-contaminated media). Sanitary waste is collected for recycle or disposal at an off-Site landfill, such as the Front Range Landfill, Inc. in Erie, Colorado, a Subtitle D-regulated facility. Special sanitary waste is identified to the sanitary waste program for specific requirements on a case-by-case basis.

6.2.6 Waste Containing Beryllium

Beryllium-contaminated waste may be generated during facility component removal, size reduction, and decontamination activities. Equipment or articles originating from buildings containing beryllium contamination equal to or above 0.2µg/100 cm^2 or known to be contaminated with beryllium will have a representative sample taken to determine release methodology. Beryllium-contaminated equipment determined to be waste will be disposed at an off-Site disposal facility. Beryllium-contaminated waste may be free of radioactive or hazardous contaminants (i.e., special sanitary waste), or it may be

[49] Section 3021(b) of RCRA (42 USC 6901 *et seq*.), as amended by the Federal Facility Compliance Act (FFCAct) of 1992 (42 USC 6961), required DOE to prepare a Site Treatment Plan describing the development of treatment capacities and technologies for LLM wastes.

radioactive and/or hazardous (i.e., it could also be LL, LLM, TRU, TRM, or hazardous waste). Disposal options for beryllium waste will vary depending on other contaminants present in the waste.

6.2.7 Asbestos Containing Material

Asbestos containing material (ACM) in the form of pipe and equipment insulation, mastic, and floor and ceiling tiles was used extensively in buildings across the Site. ACM will be removed and packaged for disposal at an off-Site TSD facility. Non-radioactive, non-hazardous ACM is defined as special sanitary waste. Some ACM may also be contaminated with radioactivity and/or hazardous components (i.e., it could also be LL, LLM, TRU, TRM, or hazardous waste). Disposal options for ACM will vary depending on other contaminants present in the waste.

6.2.8 Wastewater

Consistent with provisions of the RFCA Implementation Guidance Document (IGD)[50], wastewater generated during decommissioning will be collected and characterized to determine the appropriate management option (e.g., on-Site treatment and/or storage pending off-Site treatment and/or disposal). During this time, either of two process waste tanks in Building 731[51] and/or a tank in Building 732[52] may be used as flow-through devices for RCRA-regulated liquids and non-RCRA-regulated liquids collected for transfer to Building 374 for treatment. As flow-through devices, these tank systems will not be used to accumulate liquids for extended periods of time awaiting transfer. Prior to use, appropriate tank management requirements (e.g., waste residence time, inspection, leak detection, closure requirements) will be identified and implemented in consultation with the LRA.

6.2.9 Building Rubble & Structural Construction Debris

Building demolition activities will result in the generation of large quantities of concrete rubble, reinforcing steel, roofing, and miscellaneous materials meeting the applicable unrestricted release criteria (see Table 4). The majority of this material will be concrete, cinder block, or other similar debris that will be suitable for use as fill material to contour the land when decommissioning is complete. Disposition of this material as fill is covered under the RSOP for Recycling Concrete. Any remaining demolition debris that meets the unrestricted release criteria but is not structurally suitable for fill will be disposed of as non-routine sanitary waste. Building rubble and structural construction debris that do not meet the unrestricted release criteria will be disposed of at an off-Site TSD facility.

6.3 Management Requirements for Compliance Order Wastes

The Site's inventories of waste chemicals, idle equipment containing hazardous materials, and mixed residues contained in tank systems are governed by the terms and conditions of compliance orders on consent.

6.3.1 Idle Equipment Containing Hazardous Materials Inventory

Idle equipment containing hazardous materials is managed under the Idle Equipment and Hazardous Waste Tank Compliance Order on Consent.[53] Table 17 contains a list of the currently-identified

[50] Rocky Flats Cleanup Agreement (RFCA), Appendix 3, RFCA Implementation Guidance Document (latest version).

[51] Former RCRA 90-day tanks #731-651 and 731-652.

[52] Interim Status Unit 40.16.

[53] Idle Equipment and Hazardous Waste Tanks Compliance Order on Consent (97-08-21-01), including the RFETS Idle Equipment Management Plan, 01/28/00.

equipment in Building 707. Some of this equipment may be dispositioned during deactivation and additional pieces of equipment may be identified during deactivation and decommissioning. An up-to-date list will be maintained in the Building 707 Closure Project Files. All idle equipment containing hazardous materials, both existing and newly identified, will be managed as follows:

- Idle equipment designated as Category 1, 2, or 3 equipment will be posted with a sign or tag stating the following: *This idle equipment contains material that, if released, could affect worker safety or the environment. Report any spillage to supervision immediately.*
- Idle equipment will be subject to the following inspection schedule:
  - Hazard Category 1: Monthly
  - Hazard Category 2: Bi-monthly
  - Hazard Category 3 & 4: No inspections required
- Inspections will be conducted by RCRA-qualified waste inspectors, who will ensure the equipment is posted, in good condition, and not leaking. Inspectors will document their inspections in an inspection log, noting any required corrective measures.

Table 17. Building 707 Idle Equipment with Hazardous Materials Inventory

Location	Idle Equipment Number	SET #	Description	Material	Hazard Category	Rad-Contaminated ?	Quantity
Outside	707-0002	N/A	Carbon tetrachloride Tank #26150 and associated ancillary equipment	Carbon tetrachloride	3	No	Dry residue
Module A, Rm. 100	707-0024	1	Lodge & Shipley Lathe	Coolant oil, carbon tetrachloride	3	Yes	½"
Module C, Rm. 110, GB-C105	707-0035	3	Harding Lathe	Coolant oil, carbon tetrachloride	3	Yes	1/16" to 1/8"
Module C, Rm. 110, GB-C115	707-0036	3	Lodge & Shipley Lathe	Coolant oil, carbon tetrachloride	3	Yes	> 2"
Module C, Rm. 110, GB-C125	707-0037	3	Chucker Lathe	Coolant oil, carbon tetrachloride	3	Yes	½"
Module C, Rm. 110, GB-C25A	707-0039	3	Heald T-Base Lathe	Coolant oil, carbon tetrachloride	3	Yes	¼"
Module C, Rm. 110, GB-C25B	707-0040	3	Heald T-Base Lathe	Coolant oil, carbon tetrachloride	3	Yes	¼"
Module C, Rm. 110, GB-C45A	707-042A	3	Heald T-Base Lathe	Coolant oil, carbon tetrachloride	3	Yes	2"

Location	Idle Equipment Number	SET #	Description	Material	Hazard Category	Rad-Contaminated ?	Quantity
Module C, Rm. 110, GB-C45B	707-0043	3	Heald T-Base Lathe	Coolant oil, carbon tetrachloride	3	Yes	2”
Module C, Rm. 110, GB-C65A	707-0044	3	Heald T-Base Lathe	Coolant oil, carbon tetrachloride	3	Yes	1/2”
Module C, Rm. 110, GB-C65B	707-0045	3	Heald T-Base Lathe	Coolant oil, carbon tetrachloride	3	Yes	1/2”
Module B, Rm. 105, GB-B105	707-0067	2	Rolling Mill	Coolant oil, carbon tetrachloride	3	Yes	10 gallons
Module B, Rm. 105, GB-B20	707-0068	2	Lodge & Shipley Lathe	Coolant oil, carbon tetrachloride	3	Yes	<10 gallons
Module C, Rm. 110, GB-C60	707-0071	3	Heald T-Base Lathe	Coolant oil, carbon tetrachloride	3	Yes	10 gallons

- Hazardous waste contained in idle equipment will be drained or removed to the point of being empty. For surfaces of the equipment that are visible and readily accessible, the affected surfaces (i.e., surfaces that may have come into contact with hazardous waste) will be cleaned or wiped visually clean (i.e., no oily surface or sheen) to satisfy the RCRA definition of a "clean debris surface."[54] In the event the clean debris surface standard cannot be met, the equipment will be cleaned or wiped down to remove as much removable contamination as reasonably possible, with the objective of eliminating significant risk from the remaining residuals.
- The hazardous waste will be characterized in accordance with 6 CCR 1007-3, Part 262.11. Sampling methods, if used, will comply with those listed in Appendix I of 6 CCR 1007-3, Part 261. Analytical test methods, if used, will comply with those instructions contained in either EPA Manual SW-846 or RFETS "L-Procedures."
- When empty, the equipment will be characterized and managed in accordance with the applicable ARARs.

6.3.2 Mixed Residues

Building 707 has an existing inventory of residues and residues mixed with hazardous waste, which are being treated and/or repackaged in preparation for shipment to WIPP. Residues are plutonium-contaminated liquids and solids that were once held in reserve at RFETS, because they contain plutonium in sufficient quantities to warrant treatment for recovery of nuclear material. The mixed residue tank units located within the Building 707 Cluster are listed in Table 18.

[54] A "clean debris surface" is defined as "a surface that, when viewed without magnification, is free of all visible contaminated soil or hazardous waste except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices, and pits may be present provided such staining and soil and waste in cracks, crevices, and pits is limited to no more than 5% of each square inch of surface area." (6 CCR 1007-3, Section 268.45)

Table 18. Building 707 Mixed Residue Tank Units

RCRA Unit	Rm.	SET	Description	Associated EPA Waste Codes	Proposed Closure
92.001	C-Pit	3	Tank V-100	F001, F002	Physically Empty => Removal
92.002	C-Pit	3	Tank V-30	F001, F002	Physically Empty => Removal
92.003	C-Pit	3	Tank V-31	F001, F002	Physically Empty => Removal
92.004	C-Pit	3	Tank V-1	F001, F002	Physically Empty => Removal
92.005	C-Pit	3	Tank V-12	F001, F002	Physically Empty => Removal
92.006	C-Pit	3	Tank V-13	F001, F002	Physically Empty => Removal
92.007	C-Pit	3	Tank V-14	F001, F002	Physically Empty => Removal
92.008	C-Pit	3	Tank V-15	F001, F002	Physically Empty => Removal
92.009	C-Pit	3	Tank V-16	F001, F002	Physically Empty => Removal
92.010	C-Pit	3	Tank V-17	F001, F002	Physically Empty => Removal
92.011	C-Pit	3	Tank V-18	F001, F002	Physically Empty => Removal
92.012	C-Pit	3	Tank V-19	F001, F002	Physically Empty => Removal
92.013	C-Pit	3	Tank V-2	F001, F002	Physically Empty => Removal
92.014	C-Pit	3	Tank V-3	F001, F002	Physically Empty => Removal
92.015	C-Pit	3	Tank V-4	F001, F002	Physically Empty => Removal
92.016	C-Pit	3	Tank V-5	F001, F002	Physically Empty => Removal
92.017	C-Pit	3	Tank V-6	F001, F002	Physically Empty => Removal
92.018	C-Pit	3	Tank V-7	F001, F002	Physically Empty => Removal
92.019	C-Pit	3	Tank V-8	F001, F002	Physically Empty => Removal

The existing inventory of liquid mixed residues contained in tanks and ancillary equipment has been managed under the terms and conditions of the Mixed Residue Compliance Order on Consent.[55] As part of facility deactivation, these tanks were tapped and drained in 1998. The tanks are currently in a physically empty configuration and are inspected quarterly. In the event additional inventory is discovered in a tank during decommissioning, Building 707 Facility management will develop an action plan to determine the source of the liquid, or schedule a sampling event or other appropriate action to make a hazardous waste determination. If appropriate, the action plan may include draining the liquid from the system. The Building 707 Closure Project Health and Safety Plan (HASP) contains pre-planning requirements for responses to possible releases from mixed residue tank systems. Pre-planning activities include identification of vital elements of the tank system, identification of locations of primary shut-off valves capable of isolating feed to a tank, and a pre-release plan, which specifies the recommended method to drain the tank system (e.g., hot tapping at a low spot, draining into bottles, or draining into another tank system). Facility operations personnel are trained to implement the pre-release plan and accompanying shut-off procedures. In the event of an actual release from a mixed residue tank system, the Site's RCRA Contingency Plan will be followed.

[55] Mixed Residue Compliance Order on Consent (99-09-24-01), including the Mixed Residue Tank Plan.

In accordance with paragraph 66(i) of the Mixed Residue Compliance Order on Consent, the order is hereby terminated as to each of the mixed residue tanks located in Building 707.

6.4 Waste Treatment

Remediation waste generated during decommissioning may be treated in the Site's existing RCRA-permitted treatment units; under the generator treatment provisions of 6 CCR 1007-3, Part 264.1(g)(6); under the debris rule standard identified in the 6 CCR 1007-3, Part 258.45; or in temporary units (TUs) established under the substantive requirements of 6 CCR 1007-3, Part 264.553.

6.5 Waste Disposal

Wastes generated as a result of facility decommissioning activities will be packaged and characterized in compliance with RFETS waste management procedures[56], which implement TSD WAC and DOT packaging requirements. TSDs are selected by the contractor based on periodic environmental audits of facilities offering the required waste management services (i.e., treatment and disposal). Audits are performed in accordance with the requirements of the Off-Site Waste Management Program[57] and results are documented in Off-Site Waste Management Facility Use Decisions (FUDs).

6.6 Waste Minimization and Recycling

Waste minimization and recycling will be integrated into the planning and management of the remediation waste generated during decommissioning. Unnecessary generation of sanitary, hazardous, LL/LLM, TRU/TRM, and TSCA waste will be controlled using work techniques that prevent the contamination of areas and equipment; preventing unnecessary packaging, tools, and equipment from entering radiological contaminated areas; and reusing contaminated tools and equipment when practical.

Standard decontamination operations and processes will be evaluated for waste minimization potential and suitable minimization techniques will be implemented. Property with radiological contamination or property containing hazardous materials may be reused or recycled on Site, off Site by other DOE facilities, or by publicly or privately owned facilities having proper authorization to take possession of the property. Materials generated during decommissioning will be recycled based on availability of appropriate recycle technologies, availability of approved recycle facilities, and cost effectiveness. Table 19 describes the recycling options that will be considered for the Building 707 Closure Project.

[56] See the Building 707 Waste Stream and Residue Identification & Characterization (WSRIC), (latest revision); Waste Characterization, Generation, and Packaging (PRO-079-WGI-001), (latest revision); Solid Radioactive Waste Packaging (4-D99-WO-1100), (latest revision); and Non-Radioactive Waste Packaging (PRO-301-WP-1027/NONRAD), (latest revision).

[57] Off-Site Waste Management Program (1-MAN-037-OWMP), (latest revision).

Table 19. Material Recycling Options

Material	Recycle Option	Comments
"Clean" scrap metal (not radioactively contaminated and not considered hazardous in accordance with RCRA)	Recycle through approved scrap metal vendors or via contract.	Material must meet receiving facility's WAC and licensing requirements, if any.
Radioactively contaminated scrap metal	Recycle by means of metal melt process vendors or contract.	Material must not exceed contamination types and levels identified in the receiving facility's WAC and licensing requirements, if any.[58]
Radioactive mixed scrap material (i.e., radioactively contaminated scrap metal mixed with hazardous constituents)	None	Currently trying to locate and approve facilities that can manage this type of material.
Non-radioactive scrap metal contaminated with beryllium	Decontaminate and recycle through approved commercial facility.	Decontamination must meet the release criteria prescribed by 10 CFR 850.
Clean building rubble	Reuse on Site as backfill.	Must meet release criteria established in the RSOP for Recycling Concrete.
Clean wiring and other electrical components.	Recycle through approved commercial recycling facility.	Material must not exceed contamination types and levels identified in the receiving facility's WAC and license.
Clean bulk plastics and glass	Recycle through approved commercial recycling facility.	Material must not exceed contamination types and levels identified in the receiving facility's WAC and license.
Used lead acid batteries	Recycle through approved commercial recycling facility.	Material must meet receiving facility's WAC and licensing requirements, if any.
Used oil	Recycle through approved commercial fuel blending facility.	Material must meet receiving facility's WAC and licensing requirements, if any.

[58] On January 12, 2000, the Secretary of Energy placed a moratorium on DOE's unrestricted release of scrap metals for recycling, pending a decision by the Nuclear Regulatory Commission (NRC). This was followed by a memorandum to DOE department heads on July 13, 2000, directing further action in four areas: (1) improvement of DOE's release criteria and monitoring practices; (2) expansion of efforts to promote reuse and recycling within the DOE Complex; (3) improvement of DOE's management of information concerning material inventories and releases; and (4) accelerated recovery of sealed sources. In addition, the Secretary suspended the unrestricted release for recycling of scrap metals from radiation areas within DOE facilities.

7.0 CLOSURE OF RCRA-REGULATED UNITS

The RCRA-regulated units located within the Building 707 Cluster are listed in Table 20, and associated unit-specific closure information is provided in Appendix C. These units will be closed in compliance with the closure performance standards described in this section. All units will be closed prior to facility demolition. The LRA will be provided with timely notification of RCRA closure activities.

7.1 Closure Options

Closure may be conducted in two stages: first by rendering a unit or portion of a unit "RCRA stable" if it is a permitted or interim status unit, [59] or "physically empty" if it is a mixed residue unit[60], then by completing the activities associated with the closure options described below. The RCRA closure process flow is depicted in Figure 13.

7.1.1 Clean Closure

RCRA-regulated units may be "clean closed" by documenting the absence of contamination or by decontaminating the unit.

Clean Closure Option #1: For units having a complete, detailed operating history, clean closure will be demonstrated when the following criteria are met:

- A visual inspection of the unit and associated ancillary equipment notes an absence of hazardous or mixed waste stains and/or residuals, and
- A review of the RCRA Operating Record and building files indicates hazardous or mixed waste was never spilled in the unit, or
- The LRA agrees the existing documentation demonstrates that all releases were adequately cleaned up (i.e., if a spill did occur, all visible residual liquids and solid wastes were removed and the spill area was decontaminated).

[59] "RCRA stable" is the first step toward closure of permitted or interim status units, whereby wastes are removed from the unit and the possibility of future waste input is eliminated. For tank systems, this means a tank and its ancillary equipment have been drained to the maximum extent possible using readily available means, with the objective of achieving less than one percent holdup, and with no significant sludge and no significant risk remaining. Physical means, such as lock out/tag out or blank flanges, must then be used to ensure no waste is introduced to the system is defined in Part X.E of the RFETS RCRA Part B Permit and Closure Plan for Interim Status Units.

[60] "Physically empty" is the "RCRA stable" counterpart for mixed residue tanks. "Physically empty" is defined in the Mixed Residue Tank Plan as the condition of a tank or ancillary equipment in which no liquid remains after verification from personnel who are familiar with the tank system or by a proven technology (e.g., by draining at low points or by non-destructive testing).

Table 20. Building 707 RCRA-Regulated Units

SET #	Unit #	Bldg.	Unit Description	Regulatory Status	EPA Waste Codes
1-10 and 12	707.1	707	Container Storage	PERMITTED	D001-D012, D015-D019, D021-D029, D033, D035-D038, D040-D043, F001-F003, F005-F007, F009, U227
1, 2, 3, 4, 5 and 7	92.001 to 92.019	707	Mixed Residue Tanks (Module C Pit): Tank V-100, V-30, V-31, V-1, V-12, V-13, V-14, V-15, V-16, V-17, V-18, V-19, V-2, V-3, V-4, V-5, V-6, V-7, V-8	RCRA STABLE (and also physically empty) per 99-DOE-03494 (1/28/99); approved by CDPHE 8/23/99; currently subject to quarterly inspections	F001, F002
1	707.1	707	Container Storage, Module A, Gloveboxes A-25, A-30 (90.106), A-35, A-45, and A-55	PERMITTED	D001-D012, D015-D019, D021-D029, D033, D035-D038, D040-D043, F001-F003, F005-F007, F009, U227
1	707.3A	707	Salt Stabilization Process: Module A, Gloveboxes A-70, A-75, A-80, A-85, A-90, A-100, A-120, A-125 (90.106), and Furnaces	PERMITTED but never activated; never used to treat hazardous waste.	N/A
1	90.59	707	Container Storage, C-Cell, Module A	No longer subject to RCRA regulation; closed in accordance with "RCRA Closure Plan for Mixed Residue Container Storage Units," (11/22/98); closure certification signed 5/20/96 (ref. 96-DOE-07053, 5/28/96)	N/A
3	90.146	707	Container Storage, Glovebox C-40, Module C	Never used for hazardous waste; not subject to RCRA regulation; withdrawn 10/26/94 (ref. 94-DOE-10453)	N/A
4	707.3C	707	Dry Residues Repackaging Process: Module D, Gloveboxes D-30, D-35, D-40, D-45, D-75, D-90, D-95, and Crusher, Saws, Milling Machine, and Hand Tools	PERMITTED but never activated; never used to treat hazardous waste	N/A

SET #	Unit #	Bldg.	Unit Description	Regulatory Status	EPA Waste Codes
5	707.1	707	Container Storage, Module E, Gloveboxes E-55 and E-115	PERMITTED	D001-D012, D015-D019, D021-D029, D033, D035-D038, D040-D043, F001-F003, F005-F007, F009, U227
5	707.3B	707	Ash Stabilization Process: Module E, Gloveboxes E-20, E-25, E-35, E-60, E-65, E-70, E-95, E-105, E-110, E-125, hammer mill, sieves, and furnaces	PERMITTED	D004-011, F001, F002, F005-F007, F009
7	90.105	707	Container Storage, Rm. 130B	Never used for hazardous waste; not subject to RCRA regulation; withdrawn 10/26/94 (ref. 94-DOE-10453)	N/A
8	90.75	707	Container Storage, Rm. 136 (H-Vault)	Never used for hazardous waste; not subject to RCRA regulation; withdrawn 10/26/94 (ref. 94-DOE-10453)	N/A
8	90.76	707	Container Storage, Module H, (H-Cage)	Never used for hazardous waste; not subject to RCRA regulation; withdrawn 10/26/94 (ref. 94-DOE-10453)	N/A
9	707.1	707	Container Storage, Module J, Gloveboxes J-35 and J-55	PERMITTED	D001-D012, D015-D019, D021-D029, D033, D035-D038, D040-D043, F001-F003, F005-F007, F009, U227
9	90.74	707	Container Storage, Rm. 141 (J-Vault)	Mixed Residue unit; not in active use, but not RCRA stable	TBD
9	90.98	707	Container Storage, Rm. 142 (J-Closet)	Never used for hazardous waste; not subject to RCRA regulation; withdrawn 10/26/94 (ref. 94-DOE-10453)	N/A
9	92.020	707	Pu Stabilization Unit, Glovebox 25, Module J	Never used for hazardous waste; not subject to RCRA regulation	N/A
9	92.021	707	Pu Stabilization Unit, Glovebox 60, Module J	Never used for hazardous waste; not subject to RCRA regulation	N/A
10	90.147	707	Container Storage, Glovebox K-45, Module K	Never used for hazardous waste; not subject to RCRA regulation; withdrawn 10/26/93 (ref. 94-DOE-10453)	N/A

SET #	Unit #	Bldg.	Unit Description	Regulatory Status	EPA Waste Codes
10	707.1	707	Container Storage, Module K, Gloveboxes K-65 and K-75	PERMITTED	D001-D012, D015-D019, D021-D029, D033, D035-D038, D040-D043, F001-F003, F005-F007, F009, U227
12	92 series	707	Overhead piping associated with the Module C Pit Mixed Residue Tanks	PERMITTED	F001, F002
12	90.27	707	Container Storage, C&D Halls	Never used for hazardous waste; not subject to RCRA regulation; Withdrawn 10/26/94 (ref. 94-DOE-10453).	N/A
12	90.28	707	Container Storage, E&F Halls	No longer subject to RCRA regulation; closed in accordance with "RCRA Closure Plan for Mixed Residue Container Storage Units," (11/22/98); closure certification signed 5/26/96 (ref. 96-DOE-07053, 5/28/96)	N/A
12	90.60	707	Container Storage, G&H Halls	No longer subject to RCRA regulation; closed in accordance with "RCRA Closure Plan for Mixed Residue Container Storage Units," (11/22/98); closure certification signed 5/26/96 (ref. 96-DOE-07053, 5/28/96).	N/A
17	40.16	732	Laundry Waste Tank T-4	INTERIM STATUS	F001-F003, F005, F007-F009

Figure 13. Closure Process Flow for RCRA-Regulated Units

Clean Closure Option #2: Units to be "clean closed" by chemical decontamination will be flushed and washed with a suitable decontamination solution to remove visible waste residuals and contaminants of concern, then rinsed with clean water. The final rinsate will be tested to determine whether:

- The pH of the rinsate is between 6 and 9, and
- The concentrations of priority pollutants (identified as having been managed in the unit) and heavy metals are below the Tier II action levels for ground water, as defined in Attachment 5 of RFCA. Rinsate meeting the Tier II groundwater action levels for listed waste constituents associated with the unit and the LDR standards for characteristic waste (as required for disposal) will be deemed to be "no longer contained in" and will be managed as non-hazardous waste.

The final rinsate will not exceed a volume of two gallons per 100 ft^2 of surface area rinsed, and for internal surfaces, such as tank systems, the final rinsate will not exceed a volume of 5% of the capacity of the system. If test results indicate the standard has been met, the unit will be considered "clean closed." Units that cannot be decontaminated to meet the performance standard will be removed prior to building demolition and managed as hazardous or mixed waste.

Decontamination residuals (i.e., the rinsate and equipment used to decontaminate the unit) will be characterized and disposed of in accordance with the applicable regulations.

Clean Closure Option #3: A third "clean closure" option will be available for floors and/or foundations within RCRA-regulated units that have been scabbled, hydroblasted, or decontaminated using another abrasive technique. This option will be used when a floor and/or foundation will be left in place after facility demolition.

Following decontamination using an abrasive technique, floors and/or foundation surfaces meeting the following criteria will be considered "clean closed":

- A visual inspection of the unit and associated ancillary equipment confirms the absence of hazardous or mixed waste stains and/or residuals; and
- Radiological surveys verify surfaces are at or below the unrestricted release criteria listed in Table 4.

Decontamination residuals (e.g., scabbled concrete, decontamination water) will be characterized and disposed of in accordance with the applicable regulations.

7.1.2 Unit Removal in Conjunction with "Debris Rule" Treatment

Alternatively, RCRA-regulated units may be closed by removal and treatment under the "debris rule." The "debris rule" applies to unit equipment or structures that have no intended use or reuse, and are slated for removal and discard. To meet the "debris rule" standard, decontamination will be conducted using the "abrasive blasting" physical extraction technology, or other appropriate technology identified in Part 268.45 of 6 CCR 1007-3 (Table 1, Alternative Treatment Standards for Hazardous Debris). If, after "debris rule" treatment, the equipment or structure meets the standard for a "clean debris surface,"[61] and it does not exhibit a hazardous waste characteristic, it will no longer be considered a hazardous waste and will be managed as a solid waste. In the event the standard is not met, the equipment or structure will be removed and managed as hazardous or mixed waste. Treatment residuals, including rinsates generated

[61] A "clean debris surface" is defined as "a surface that, when viewed without magnification, is free of all visible contaminated soil or hazardous waste except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices, and pits may be present provided such staining and soil and waste in cracks, crevices, and pits is limited to no more than 5% of each square inch of surface area." (6 CCR 1007-3, Part 268.45)

from extraction and/or destruction technologies used in the closure of RCRA-regulated units, will be characterized in compliance with 6 CCR 1007-3, Part 262.11, and managed accordingly.

7.1.3 Unit Removal without On-Site Treatment

RCRA units that are not decontaminated to meet the "clean closure by decontamination" standard will be removed, size-reduced, if necessary, and packaged to meet the waste acceptance criteria (WAC) of the approved disposal facility. In the event this waste cannot be shipped directly to a disposal facility, it will be stored in compliance with the remediation waste management requirements identified in individual Building Operations Orders and with the ARARs identified in Appendix A.

7.2 Closure Documentation

For units undergoing clean closure in accordance with Section 7.1.1 of this DOP, a closure certification will be prepared and signed by an independent, Colorado registered, professional engineer. The closure certification will be submitted to the LRA for review and concurrence within 60 days after completion of the associated closure activities. Units removed in accordance with Sections 7.1.2 and 7.1.3 will not require a professional engineer's certification.

In addition, RCRA unit closure activities will be documented in the Building 707 Closure Project AR File and referenced in the PDSR, which will be completed prior to building demolition. Upon final closure of each RCRA-regulated unit, the Site's Master List of RCRA Units will be updated to reflect the new closure status of the unit and the unit will be removed from the RCRA Part A and Part B Permits in accordance with the applicable hazardous waste regulations.[62]

[62] Code of Colorado Regulations, 6 CCR 1007-3, Section 100.63, Permit Modification at the Request of the Permittee.

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8.0 ENVIRONMENTAL CONSEQUENCES

RFCA mandates incorporation of National Environmental Policy Act (NEPA) values into all RFCA decision documents. The following paragraphs summarize the results of the environmental impact analysis, which was performed for the full scope of the Building 707 Closure Project, including building component removal, size reduction, decontamination, and demolition activities and removal of materials and waste from the Building 707 Cluster, as well as the Project's contribution to the cumulative impacts of Site-wide closure activities and other major federal actions occurring within the vicinity of the Site.

8.1 Environmental Impact Issues

As described in earlier sections, the buildings within the 707 Cluster are located entirely within PA of the Site's Industrial Area. Initial investigations show that many interior surfaces, process drains, piping, gloveboxes, filters, sumps, and other equipment are radioactively contaminated.

The proposed closure activities for the Type 3 and Type 2 buildings include asbestos abatement; decontamination of interior surfaces and equipment by vacuuming and wiping; disconnection of electrical power; draining of piping systems and equipment; removal of gloveboxes and other equipment; further decontamination by wiping, washing, scabbling, and other methods; and dismantling and demolition of the buildings. Given the existing environment and industrial setting, environmental impact issues associated with the Building 707 Closure Project are relatively limited. The proposed activities should not result in discernible long-term adverse effects to biological resources, including vegetation, wetlands, wildlife habitat, or threatened and endangered species populations or their habitat. The buildings to be decommissioned are not located in a floodplain and the proposed activities will not affect or be affected by any floodplain. No wild and scenic rivers, prime agricultural soils, parks, or conservation areas will be affected. The proposed activities will provide employment for a limited number of people, most from the current Site work force. Thus, the activities are unlikely to result in adverse socioeconomic effects. As a result, the focus of this analysis is on the following additional areas:

- Mobilization of radioactive and other contaminants into soil, air, surface water, or ground water;
- The health and safety of workers who may be exposed to radioactive, toxic or hazardous materials or waste;
- The health and safety of the public, resulting from closure activities, including potential accidents; and
- This project's contribution to Site-wide or nearby cumulative impacts.

8.2 Impacts to Geology and Soils

Decommissioning activities in the Building 707 Cluster will disturb minor land acreage, most of which has been disturbed previously. There will be a short-term increase in soil erosion and siltation surrounding building drainage pathways. Volatile organic compounds and radionuclide contamination already exist in the Building 707 footprint and adjacent areas.

8.3 Impacts to Air Quality

Potential impacts to air quality resulting from the closure of the Building 707 Cluster include:

- Release of asbestos fibers from ACM removal activities,
- Release of beryllium and radionuclides from the decontamination and removal of equipment and building material,
- Release of hazardous air pollutants from the removal of waste oil collection and organic solvent tanks, and
- Fugitive dust emissions from demolition and associated transportation activities.

Air emissions from these activities will be controlled and monitored in accordance with the Site health and safety program and air quality ARARs presented in Section 4.0 of this DOP. Controls used for individual decommissioning activities will be selected during the planning and engineering phase of the IWCP process and described in the associated IWCP work packages.

Asbestos is present in several areas, primarily in the form of pipe insulation. This material will be removed in accordance with applicable ARARs. There is minimal risk of an asbestos release to the atmosphere if the removal, transportation, and final disposition are conducted in accordance with the applicable ARARs because the ARARs are designed to prevent a release to the environment.

Decontamination, size reduction, removal, and ultimate disposal of equipment and materials in the Type 3 and Type 2 buildings have the potential to release radionuclides and residual chemical vapors to the air. As a result, decontamination and size reduction activities will take place within containment (e.g., tents) and the building HVAC systems will be configured and controlled to ensure that air flows from areas of least contamination (e.g., corridors, rooms) to areas of higher contamination (e.g., gloveboxes). Air streams will be filtered through various stages of high efficiency particulate air (HEPA) filters, which remove particulate contamination. System interlocks will be used to shut down air supply systems to prevent air reversals in the event of a loss of exhaust airflow. National Emission Standards for Hazardous Air Pollutants (NESHAPs), (40 CFR 61, Subpart H), requires air emissions monitoring for any release point having estimated uncontrolled radioactive air emissions in excess of 0.1 mrem/year effective dose equivalent (EDE) to any member of the public. As necessary, monitoring will be performed utilizing the existing effluent stack monitors, the existing Radioactive Ambient Air Monitoring Program (RAAMP) network, and/ or project-specific air monitoring methods described in the Site Integrated Monitoring Plan[63].

8.4 Impacts to Water Quality

Potential impacts to surface water and storm water runoff resulting from closure activities include the release of liquids via drains or doors that have direct access to the outdoor environment. However, such releases are unlikely because all work will be performed in accordance with the requirements of the Site's safety management programs. Decommissioning activities involving liquids will be identified to ensure drains and/or doorways are appropriately blocked.

Techniques under consideration for decontamination of the building equipment include the use of water or steam to remove radiological contamination and loose debris. If selected, these decontamination techniques will be used while the building shell and utility support systems are still intact. While these techniques are effective in removing radiological contamination, they may also generate large volumes of

[63] Site Integrated Monitoring Plan (latest revision).

potentially contaminated water. Contaminated water will be sampled before release or transfer to Building 374 or other approved treatment facility.

In addition, fine water misting may be used to control fugitive dust during demolition activities. This water will be managed under the Site's incidental waters program.

Because aboveground structures such as cargo containers will be removed, some new bare ground may be exposed to wind and water erosion, and surface water flow characteristics may be impacted. When appropriate, silt fencing or similar protective devices will be installed to prevent or minimize the possibility of water-borne soil leaving the immediate area and entering drainage ways.

8.5 Impacts to Human Health

Because the nature of decommissioning work is to remove or fix contamination in place, closure activities have the potential to expose involved workers, non-involved workers, and the public to radiological and other chemical contamination. Disturbance of contaminants increases the chance of the contaminants to be dislodged, become airborne, and be inhaled by or deposited on humans. Human health impacts will be controlled, mitigated, and monitored in accordance with the RFETS occupational health and industrial safety programs.

8.6 Radiological Health Impacts

Radiological dose calculations for workers and the public are based on information contained in the Rocky Flats Cumulative Impacts Document (CID).[64] The CID radiological dose calculations are based on a 100,000 ft^2 generic plutonium processing facility representative of plutonium processing facilities at RFETS. At approximately 200,000 ft^2, Building 707 is about twice as large as generic facility. As a result, the dose rates to the workers and public in the CID have been proportionately increased to estimate worker and public health impacts for Building 707. No other adjustments are needed because the assumptions used for the CID calculations were similar to conditions for Building 707 (e.g., work crew sizes, activities, and schedules are similar in both cases).

For involved workers, closure activities in the Building 707 Cluster are estimated to result in a total dose of 132 person-rem. This exposure is expected to result in less than one latent cancer fatality, assuming the same worker group of 24 people conducts both deactivation and decommissioning activities. This is a conservative estimate since work crews will be assigned so individual workers will be protected in accordance with the Site's 500 mrem control level. Doses to co-located workers from closure operations in the Building 707 Cluster alone have not been evaluated. However, the annual radiological exposure of a maximally exposed co-located (unprotected) worker as a result of Site-wide closure activities is estimated at 5.4 mrem. The corresponding risk of a latent cancer fatality to this worker is two in 1,000,000.

Annual dose to the maximally exposed off-Site individual from Site closure activities is estimated at 0.23 mrem, with a corresponding excess latent cancer fatality of 1 in 10,000,000. The annual dose to the public as a result of all activities performed as part of the Rocky Flats Closure Project at the peak time of exposure (1997 - 2006), is expected to be a total of 23 rem for the 2.7 million people projected to be living within 50 miles of the Site in 2006. This annual dose of 23 person-rem is expected to result in less than one (0.01) latent cancer fatality in the entire Denver area population. Estimated annual dose to the maximally exposed off-Site individual is well below the applicable standard of 10 mrem/year.

[64] Rocky Flats Cumulative Impacts Document (CID), (latest revision).

Estimated doses to the maximally exposed off-Site individual from the Building 707 Closure Project are expected to be a small fraction of the estimates for Site-wide activities, as described above. For comparison purposes, the DOE annual limit for occupational exposure as a result of all activities and through all exposure pathways is 5,000 mrem (5 rem) per person. Natural background radiation in the Denver area results in an annual exposure of approximately 350 mrem per person. Exposures to workers and the public will be controlled and monitored in accordance with the RFETS radiation safety program.

8.7 Non-Radiological Health Impacts

Non-radiological health effects from exposure to chemicals are measured by a hazard index. A hazard index greater than one is considered to be a basis for concern, and the greater the index is above one, the greater the level of concern.

For the full suite of Site closure activities, including closure of all buildings, a hazard index of 1.2 has been calculated for a co-located worker who is chronically exposed during working hours to all chemicals of concern simultaneously over the entire period of Site closure. The corresponding cancer risk is five in 100,000. For the full suite of Site closure activities, including closure of all buildings, a hazard index of 1.5 has been calculated for a member of the public who is chronically exposed every day for 70 years to all chemicals of concern simultaneously (a highly unlikely event). A more reasonable scenario of exposure to a single chemical showed hazard indices of well below one for each potentially released chemical. Analysis of potentially carcinogenic air pollutants indicates a cancer risk of three in 10,000,000 for the maximally exposed off-Site individual.

Estimated non-radiological impacts from the Building 707 Closure Project are expected to be a fraction of those estimated for Site-wide activities, as described above. Exposures to workers and the public will be controlled and monitored in accordance with the RFETS toxic/hazardous materials and chemical safety program.

8.8 Occupational Hazards

In addition to exposure to radiological and chemical hazards, workers at the Site will be exposed to a variety of industrial hazards such as heavy machinery, repetitive motion tasks, and environmental stresses such as heat and cold. Using a general industry rate for construction to estimate injury and illness cases, Site closure activities are estimated to result in 584 cases of injury and illness during the peak activity period (1997 through 2006). The portion of these cases estimated to result from closure of the Building 707 Cluster alone would be less than the total Site figure.

The rate of injury and illness for the construction industry is considerably higher than the historic incidence rate for the Site. Occupational hazards will be controlled, mitigated, and monitored in accordance with the RFETS occupational health and industrial safety programs.

8.9 Impacts to Plants and Animals

Because the Building 707 Cluster is located in the previously disturbed Industrial Area, impacts to plants and animals are expected to be minimal. Increased vehicular and pedestrian traffic could result in the disturbance of some vegetation. Small mammals, such as rats, mice, rabbits and raccoons are known to be residents of or visitors to the Industrial Area. These mammals will be displaced, and some mortality will occur as a result of closure activities.

Each spring, migratory birds, such as barn swallows, build nests in building doorways and under building over-hangs within the Building 707 Cluster. Migratory birds are protected by the Migratory Bird Treaty

Act, which prohibits the removal or destruction of bird nests without a permit from the U. S. Fish and Wildlife Service. As a result, during the early stages of project planning and scheduling, the Building 707 Closure Project Manager will work with the Kaiser-Hill Ecology Group to take preventive measures to discourage nesting or to obtain the required nest removal permits.

8.10 Impacts Associated with Waste Management Activities

Environmental impacts associated with waste management are related to human health issues, storage capacities, and transportation. In general, waste generated from the Building 707 Closure Project will include contaminated and uncontaminated equipment, tools, electrical conduit systems, ventilation systems, piping systems, gloveboxes, and facility structural materials.

Items not radiologically contaminated, or those decontaminated to a free-release condition, may be transferred for use at a different location within RFETS, for use at a different DOE facility, or sent to the PU&D organization for appropriate handling. Items that cannot be decontaminated to a free-release condition will be managed as waste, or reused on Site or at another DOE facility in accordance with applicable release criteria. Mixed waste will be managed on Site in accordance with approved Site procedures until it can be shipped for off-Site disposal. Waste will be generated, characterized, stored, and disposed of in accordance with the requirements described in Section 6.0 of this DOP.

8.11 Impacts to Historic Resources

Potential impacts related to historical resources are the loss of Building 707 as an historic structure eligible for the National Register of Historic Places, and a secondary contributor to a potential Historic District comprised of Cold War Era facilities. Sixty-four buildings within the Site's Industrial Area, including Building 707, were identified by the State Historic Preservation Officer (SHPO) as important to the historic role of the Site in manufacturing nuclear weapons components during the Cold War.

The history of the Rocky Flats Plant, including Building 707, has recently been documented in the Historic American Engineering Record for the Rocky Flats Plant Historic District.[65] This documentation, consisting of a narrative report, engineering drawings, and photographs, meets the requirements of the programmatic agreement and has been accepted by all responsible parties. Since this documentation has been approved, it effectively mitigates any adverse impacts the Building 707 Closure Project may have on historic resources.

8.12 Impacts Associated with Elevated Noise Levels

The decommissioning of the Type 3 and Type 2 buildings within the 707 Cluster is not expected to significantly increase noise levels in the Rocky Flats area. Most activities (e.g., size reduction, scabbling, abrasive blasting) will take place inside the associated buildings, so elevated noise levels will be confined to the structures in which they are generated. Workers involved in these activities will use appropriate hearing protection devices. Outdoor activities will take place at a distance from unprotected workers and the public, and are not expected to increase noise levels to an unsafe level.

8.13 Socioeconomic Impacts

The Building 707 Closure Project will contribute to a net overall loss of employment in the long run. The current on-Site work force in the building will either be drawn into the closure activities for the building (and potentially for the entire Site) or terminate employment. In the short run, closure activities may

[65] Kaiser-Hill Company, L.L.C., Historic American Engineering Record for the Rocky Flats Plant (HAER-CO-83-T), 1999.

increase the employment level due to increased needs. Additionally, a modest increase of purchases (e.g., raw materials) may result.

Under the worst -case scenario, if the entire work force currently assigned to the Building 707 Cluster elects to terminate employment, the overall impact will not have a significant adverse effect on the Denver Metropolitan area, including Boulder and Jefferson Counties, where the majority of the work force resides. The net socioeconomic effects associated with the demolition of Buildings in the 707 Cluster are expected to be minimal.

8.14 Cumulative Impacts

The Building 707 Closure Project will contribute incrementally to potential Site-wide cumulative impacts associated with the overall Rocky Flats Closure Project. Cumulative impacts are impacts to the environment resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions. Significant impacts could result from several smaller actions that, by themselves, may not have significant impacts. The cumulative effects of Site cleanup efforts are described in the CID. That document describes the short- and long-term effects from the overall Site clean-up mission. Cumulative impacts of the Building 707 Closure Project relative to the Site closure will include:

- Decommissioning activities associated with the Building 707 Closure Project will generate sanitary, hazardous, TSCA, LL, LLM, TRU, and TRM wastes. Existing on-Site interim storage for radioactive waste is limited and eventually, as Site-wide closure progresses, additional storage capacity may be needed.
- Increased traffic volume, resulting from off-Site shipments of plutonium components and waste, may cause congestion problems, an increase in traffic accidents resulting in fatalities, and an increase in potential latent cancer illnesses related to motor vehicle emissions and fugitive dust.
- Adverse socioeconomic impacts from reductions in the Site's workforce will not substantially affect the surrounding region due to additional growth projected in the area.

Some cumulative impacts may ultimately be beneficial to the environment. Remediation is currently scheduled to follow demolition of buildings in the Building 707 Cluster, which may result in the restoration of some of the Site to its original, natural condition:

- Removal of human occupation, structures, and paved surfaces, and re-establishing native grasses and other vegetation, could restore native plant communities and increase wildlife habitat, including threatened and endangered species.
- Removal of contamination will reduce health risks to human and animal populations.
- High-profile structures that have dominated the Site and the local skyline for 45 years will be eliminated. The landscape will take on a less industrial and more open, rural appearance, similar to the rangeland that characterized the area before buildings on the Site were constructed.

8.15 Mitigation Measures

Mitigation measures are designed to reduce or avoid potentially adverse effects associated with a proposed activity. For the decontamination and demolition of the Type 3 and Type 2 buildings within the 707 Cluster mitigation measures will be considered in the areas of human health, worker safety, release of emissions and mobilization of contaminants, and cultural resources.

Closure will be conducted in accordance with applicable worker and public health and safety programs; activities will be managed so that emissions and discharges are within applicable regulatory limits. Closure activities will take place within existing buildings or temporarily constructed facilities (e.g., tents) with functioning drainage, air filtration, and other safety and environmental protection systems commensurate with risks inherent in the activities being conducted.

Precautions will be taken to ensure compliance with the Migratory Bird Treaty Act, which prohibits destruction of birds or their nests, active or inactive, without a permit. Building demolition activities that would destroy nests will not be conducted during the nesting season, or measures will be taken to avoid affecting nesting birds prior to the nesting season. Activities that may affect nesting birds will be coordinated with Site ecologists. No closure activities will take place in or near the habitat of known threatened or endangered species.

8.16 Unavoidable Adverse Effects

As described in the preceding paragraphs, adverse effects will occur during the performance of specific closure activities, and effects will conclude when closure activities are complete. Activities will be planned and executed such that no effects exceed the applicable regulatory limits (see Sections 5.0 through 7.0). All environmental, safety, and health risks will be managed per industry practices, DOE policy, and Site programs (see Section 5.0).

8.17 Short-Term Uses Versus Long-Term Productivity

Unlike projects that commit a site to a particular use for a period of time, the effect of this closure project will be to undo commitments concerning use of the Site and open up a new and broad range of potential future uses. Closure does not commit the Site to a particular land use; rather, closure of the Type 3 and Type 2 buildings within the 707 Cluster will mark one step in the process of ending one use and opening consideration for a variety of other possible future short- and long-term uses.

8.18 Irreversible and Irretrievable Commitments of Resources

Funds, labor, equipment, fuel, tools, personal protective equipment, waste storage drums, and similar items are resources that will be irretrievably committed to the Building 707 Closure Project. Some resources, such as uncontaminated materials, will be recovered.

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9.0 IMPLEMENTATION SCHEDULE

The recent Site-wide re-baselining effort has resulted in the development of a detailed schedule and basis of estimate for completion of the Building 707 Closure Project. A copy of this schedule is provided in Appendix D. The schedule is not an enforceable part of this DOP and DOE or its contractor may alter the schedule without prior notification to or approval by the LRA. Significant schedule changes will be shared with the LRA as part of the RFCA consultative process.

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10.0 RECORDS DISPOSITION

Building 707 Closure Project records consist of the CERCLA Administrative Record (AR) File, the RCRA Operating Record, the Closure Project Files, and the Decommissioning Final Closeout Report and associated documentation.

10.1 CERCLA Administrative Record File

This section identifies the documents that constitute the Administrative Record (AR) file for the Building 707 Closure Project. Upon completion of the public comment period, comments received from the public will be incorporated into this DOP. LRA approval of this DOP and associated major and minor modifications constitutes approval of the AR File.

The following documents comprise the Building 707 Closure Project AR File:

- Final Rocky Flats Cleanup Agreement (RFCA)
- RFETS Decommissioning Program Plan (DPP)
- RFETS Facility Disposition Program Manual (FDPM)
- RFETS Decontamination & Decommissioning Characterization Protocol (DDCP)
- RFETS Reconnaissance Level Characterization Plan (RLCP)
- Building 707 Closure Project Joint Scoping Meeting Minutes/Disposition
- Building 707 Closure Project Reconnaissance Level Characterization Report (RLCR) and related correspondence
- Draft Building 707 Closure Project DOP
- Final Building 707 Closure Project DOP and related correspondence
- RFETS Pre-Demolition Survey Plan (PDSP)
- Building 707 Closure Project Pre-Demolition Survey Report and related correspondence
- Building 707 Closure Project Decommissioning Final Closeout Report
- Building 707 Closure Project Demolition Permit(s)
- Notification to CDPHE prior to demolition (required for asbestos abatement activities)
- Air Pollutant Emission Notification (APEN), (required if 2000 lbs. dust/volatile organic compound (VOC) emissions will be exceeded in a single event)
- Building 707 Closure Project Decommissioning Final Closeout Report and associated correspondence
- All other documents referenced in this DOP

The following information repositories have been established to provide public access to the Building 707 Closure Project AR File:

U.S. Environmental Protection Agency (EPA)
Region VIII
Superfund Records Center
999 18th Street, Suite 500
Denver, Colorado 80202-2466
(303) 293-1807

Citizens Advisory Board (CAB)
9035 Wadsworth Parkway
Suite 2250
Westminster, Colorado 80021
(303) 420-7855

Colorado Department of Public Health and Environment (CDPHE)
Information Center, Building A
4300 Cherry Creek Drive South
Denver, Colorado 80220-1530
(303) 692-3312

U.S. Department of Energy Rocky Flats Public Reading Room
Front Range Community College Library
3645 West 112th Avenue, Level B
Westminster, Colorado 80030
(303) 469-4435

10.2 RCRA Operating Record

RCRA records, including inspection records, will be maintained with the existing Building 707 RCRA Operating Record. Upon completion of the Building 707 Closure Project, the RCRA Operating Record will be transferred to Site Records Management for storage.

10.3 Closure Project Files

Project-specific documents will be stored in the Building 707 Closure Project Files until final closure is complete, at which time the Closure Project Files will be processed through Site Records Management and archived. The Closure Project Files will contain characterization documentation, inventory sheets, project correspondence, comment resolution, IWCP work packages, and additional information that is a direct result of the work involved in the project. Maintenance of the Closure Project Files is a Site requirement.

10.4 Decommissioning Final Closeout Report

Upon completion of decommissioning activities in the Building 707 Cluster, a Decommissioning Final Closeout Report will be prepared in accordance with RFCA[66] and the DPP.[67] The Closeout Report will consist of a brief description of the work completed, including:

- Any modifications to the original DOP;
- Final sampling and analysis reports;
- A description of the quantity and characteristics of the wastes generated and how the wastes were stored or disposed; and
- A statement, if true, that the goals and objectives of the Project were met and if not, what additional work is required.

[66] RFCA Implementation Guidance Document (Appendix 3 to RFCA), (latest revision).

[67] DPP Section 3.3.11, Notifying Regulators of Completion of Decommissioning (latest revision).

The expected outline for the Closeout Report is shown below. The format may change to meet the needs of the Project.

- Introduction
- Remedial action description
- Verification that remedial action goals were met
- Verification of treatment process (if applicable)
- Radiological analysis (if applicable)
- Waste stream disposition
- Site reclamation
- Deviations from the decision document
- Demarcation of where excavation took place
- Demarcation of wastes left in place
- Dates and durations of specific activities (approximate)
- Final disposition of wastes (actual or anticipated)

Upon completion, the Decommissioning Final Closeout Report will be submitted for review and concurrence by the LRA.

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11.0 COMMENT RESPONSIVENESS SUMMARY

The responsiveness summary addressing public comments on the final draft version of this DOP will be attached as Appendix E.

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GLOSSARY OF TERMS

Administrative Requirements. Administrative requirements are those mechanisms that facilitate the implementation of the substantive requirements of a statute or regulation. Administrative requirements include the approval of administrative bodies, consultation, issuance of permits, documentation, reporting, recordkeeping, and enforcement. In general, administrative requirements prescribe methods and procedures by which substantive requirements are made effective for purposes of a particular environmental or public health program.

Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are promulgated standards, requirements, criteria or limitations that will be met during closure activities to ensure the protection of human health and the environment and to ensure proper management of waste. A requirement under environmental laws may be either "applicable" or "relevant and appropriate."

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. (40 CFR 300.5)

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, their use is well suited to the particular site. Only those standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. (40 CFR 300.5)

Asbestos. Asbestiform varieties of chrysolite, amosite (cummintonite-grunerite), crocidolite, anthophyllite, tremolite, and actinolite.

Asbestos Containing Material. Material containing more than 1% friable asbestos.

CERCLA. The Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §9601 *et seq*., as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. 99-499, and the Community Environmental Response Facilitation Act, Pub. L. No. 102-26; and the National Contingency Plan and other implementing regulations. (RFCA ¶25[m])

Closure. In the context of RCRA/CHWA hazardous waste management units, closure means actions taken by an owner or operator of a treatment, storage, or disposal unit to discontinue operation of the unit in accordance with the performance standards specified in 6 CCR 1007, §264.11 or §265.111, as appropriate. (RFCA ¶25[p])

Deactivation. The process of placing a building, a portion of a building or building component (as used in the rest of this paragraph "building") in a safe and stable condition to minimize the long-term cost of a surveillance and maintenance program in a manner that is protective of workers, the public, and the environment. Actions during deactivation could include the removal of fuel, draining and/or de-energizing of non-essential systems, removal of stored radioactive and hazardous materials, and related actions. As the bridge between operations and decommissioning, based upon Decommissioning Operations Plans (DOPs) or the Decommissioning Program Plan (DPP), deactivation can accomplish operations-like activities such as final process runs, and also decontamination activities aimed at placing the facility in a safe and stable condition. Deactivation does not include decontamination necessary for the dismantlement and demolition phase of decommissioning (i.e., removal of contamination remaining in fixed structures and equipment after deactivation). Deactivation does not include removal of contaminated systems or equipment except for the purpose of accountability of SNM and nuclear safety. It also

does not include removal of contamination except as incidental to other deactivation or for the purposes of accountability of SNM and nuclear safety. (RFCA ¶25 [y])

Decommissioning. Decommissioning means, for those buildings, portion of buildings or building components (as used in the rest of this paragraph, "building") in which deactivation occurs, all activities that occur after the deactivation. It includes surveillance, maintenance, component removal, decontamination and/or dismantlement and size reduction for the purpose of retiring the building from service with adequate regard for the health and safety of workers and the public and protection of the environment. For those buildings in which no deactivation occurs, the term includes characterization, surveillance, maintenance, component removal, decontamination and/or dismantlement and size reduction for the purpose of retiring the building from service with adequate regard for the health and safety of workers and the public and protection of the environment. The ultimate goal of decommissioning is unrestricted use or, if unrestricted use is not feasible, restricted use of the buildings. (RFCA ¶25[z])

Decontamination. The removal or reduction of radioactive or hazardous contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning or other techniques to achieve a stated objective or end condition. (RFCA ¶25[aa])

Dismantlement. The demolition and removal of any building or structure or a part thereof during decommissioning. (RFCA ¶25[ab])

Facilities. Buildings and other structures, their functional systems and equipment, and other fixed systems and equipment installed therein; outside plant, including site development features such as landscaping, roads, walks, and parking areas; outside lighting and communication systems; central utility plants; utilities supply and distribution systems; and other physical plant features.

Facility Component. For the purposes of this RSOP, the term "facility component" refers to gloveboxes, tanks and ancillary piping, fume hoods, ventilation/filtration systems, other utilities and equipment, as well as building walls, ceilings, floors, and structural members.

Facility Disposition Process. The sequence of activities required to take a facility from its existing condition to final disposition. The goal of disposition is for the Site to accomplish all of the activities necessary either to demolish the building and dispose of the resulting waste or to release the building for reuse.

As discussed in RFCA Attachment 9, unless building specific conditions otherwise warrant, the following activities are typical, but not all inclusive, of those that will be performed for a building: (a) containerized waste and materials removed; (b) Liquid waste and processing systems drained; (c) RCRA units closed or have a closure plan integrated with building disposition plan; (d) all TRUM, defined as materials in excess of 100 nCi per gram, removed; (e) equipment, piping, ducts, gloveboxes, and major electrical components removed (e.g., strip out), (f) radioactive hot spots and hazardous substances removed; and (g) easily removed contamination removed. (DPP, Section 2.1)

Hazard. A source of danger (i.e., material, energy source, or operation) with the potential to cause illness, injury, or death to personnel, or damage to a facility or the environment without regard for the likelihood or credibility of accident scenarios or consequence mitigation.

Hazardous Waste. Hazardous waste is any solid waste that either exhibits a hazardous characteristic (i.e., ignitability, corrosivity, reactivity, or toxicity) or is named on one of three lists published by the EPA in 40 CFR 261, Identification and Listing of Hazardous Waste. To be considered hazardous, a waste must first meet EPA's definition of "solid waste," which includes liquids.

HVAC Systems. Heating, ventilation and air conditions systems at RFETS, which provide the differential pressures and necessary filtration required to maintain confinement of radioactive materials.

Independent Verification. An independent verification is performed by and independent contractor that takes its own measurements and samples, and/or reviews the Site's results.

Interim Measure. The RCRA/CHWA term for a short-term action to respond to imminent threats, or other actions to abate or mitigate actual or potential releases of hazardous wastes or constituents.

Interim Remedial Action. The CERCLA term for an expedited response action performed in accordance with remedial action authorities to abate or mitigate an actual or potential threat to public health, welfare, or the environment from the release or threat of a hazardous substance from RFETS.

Job Hazard Analysis. An analysis of procedurally controlled activities that uses developed procedures as a guide to address and consider the hazards due to any exposures present during implementation of (job) procedures, the use and possible misuse of tools and other support equipment required by the procedures, and the behavioral motivations of the people performing them. A type of hazard analysis process, which breaks down a job or task into steps, examines each step to determine what hazard(s) exist or might occur, and establishes actions to eliminate or control the hazard.

Low-Level (LL) Waste. LL waste is any radioactive waste that is not classified as transuranic waste, high-level waste, or spent nuclear fuel. No minimum level of radioactivity has been specified for LL waste. LL waste mixed with hazardous waste is referred to as low-level mixed (LLM) waste.

PCB Bulk Product Waste. Waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration where the concentration at the time of designation for disposal was >50 ppm PCBs. PCB bulk product waste excludes PCBs or PCB Items; but includes: 1) non-liquid bulk waste or debris from the demolition of buildings and other man-made structures; 2) PCB-containing waste from the shredding of automobiles, household appliances, or industrial appliances 3) plastics; preformed or molded rubber parts and components, applied dried paints, varnishes, waxes, or other similar coatings or sealants; caulking; adhesives; paper, Galbestos; sound-deadening or other types of insulation; and felt or fabric products such as gaskets; 4) fluorescent light ballasts containing PCBs in the potting material.

PCB Item. Any PCB Article, Article Container, PCB Container, or PCB Equipment, that deliberately or unintentionally contains, or has as a part of it, any PCB or PCBs. This category includes electrical equipment such as transformers, capacitors and switches.

PCB Remediation Waste. Waste containing PCBs as a result of a spill, release, or other unauthorized disposal, at the following concentrations: (1) materials disposed of prior to April 18, 1978, that are currently at concentrations $\geq$ 50 ppm PCBs, regardless of the concentration of the original spill; (2) materials which are currently at any volume or concentration where the original source was $\geq$ 500 ppm PCB beginning on April 18, 1978, or $\geq$ 50 ppm beginning on July 2, 1979; and (3) materials which are currently at any concentration if the PCBs are from a source not authorized for use under 40 CFR Part 761.

PCB remediation waste means soil, rags, and other debris generated as a result of any PCB spill cleanup, including, but not limited to the following: (1) environmental media containing PCBs, such as soil and gravel; dredged materials, such as sediments; settled sediment fines, and decanted aqueous liquid from sediment; (2) sewage sludge containing <50 ppm PCBs and not in use according to §760.20(a) [relating to uses of sewage sludge regulated under Parts 257, 258, and 503 of 40 CFR]; (3) PCB sewage sludge, commercial or industrial sludge contaminated as a result of a spill of PCBs including sludge located in or removed from any pollution control device, and decanted aqueous liquid from an industrial sludge; and (4) buildings and other man-made structures, such as concrete or wood floors or walls contaminated from a leaking PCB or PCB-contaminated transformer, porous surfaces and non-porous surfaces.

Physically Empty. The condition of a tank or ancillary equipment in which no liquid remains after verification by personnel who are familiar with the tank system or a by proven technology. For example, verification may be performed by draining at low points or by non-destructive testing.

Process Waste. Process waste is solid, hazardous, radioactive and/or mixed waste generated as a result of normal building operations and deactivation activities.

Radiological Contamination. Radioactive material present in a location where it should not be present.

RCRA Stable. A step toward RCRA closure, whereby wastes are removed from a RCRA-regulated unit and the possibility of future waste input is eliminated. For tank systems this means a tank and its ancillary equipment have been drained to the maximum extent possible using readily available means, with the objective of achieving less than one percent holdup, and with no significant sludge and no significant risk remaining. Physical means must then be used to ensure no waste is re-introduced to the system (e.g. lock out/tag out, blank flanges). (RCRA Part B Permit and Interim Status Closure Plan, Part X.E)

Remediation Waste. Remediation waste includes all solid, hazardous, radioactive, and/or mixed waste; all media and debris containing hazardous substances or listed hazardous or mixed wastes, or exhibiting a hazardous characteristic; and all hazardous substances generated from activities regulated under RFCA as RCRA corrective actions or CERCLA response actions, including decommissioning under an approved decision document. Remediation waste does not include waste generated from other activities (e.g., normal building operations and deactivation activities). (RFCA ¶25[bf])

Resource Conservation and Recovery Act (RCRA). The Resource Conservation and Recovery Act, 42 U.S.C. §6901 *et seq.*, as amended by the Hazardous and Solid Waste Amendments of 1984, the Federal Facility Compliance Act of 1992, and implementing regulations. (RFCA ¶25[ay])

Residues (RES). Pu-contaminated liquids and solids that were once held in reserve at Rocky Flats because they contain Pu in sufficient quantities to warrant treatment for recovery of nuclear material. Residues mixed with hazardous waste are referred to as mixed residues (REM).

RFCA Standard Operating Protocol (RSOP). Approved protocol applicable to a set of routine environmental remediation and/or decommissioning activities regulated under RFCA that RFFO may repeat without re-obtaining approval after the initial approval because of the substantially similar nature of the work to be completed. Initial approval of an RSOP will be accomplished through an interim measure/interim remedial action process.

Sanitary Waste.

Routine Sanitary Waste. This type of sanitary waste is collected in dumpsters located throughout RFETS. Typically these wastes consist of soft or compactable items generated by office/administrative and cafeteria areas and do not required a Radiological Waste Release Evaluation prior to generation or disposal into dumpsters. Typical routine sanitary waste includes: packaging and general office refuse; food waste from cafeteria or offices; non-recyclable paper, cardboard and miscellaneous glass; metal rubber; and plastic items from routine office/administrative operations.

Special Sanitary Waste. Special sanitary waste is sanitary waste that requires specific treatment, analysis, certification, and/or packaging prior to disposal off Site. Special sanitary waste includes asbestos and beryllium waste that is not hazardous waste.

SET. Small, manageable groupings of similar systems, equipment, and areas or rooms that may be worked independently. SETs serve as the foundation for prioritizing and scheduling building component removal, size reduction, and decontamination activities within a building or building cluster.

Subject Matter Expert (SME). One who possesses specialized knowledge, skills, training , experience and/or abilities in a particular profession and is therefore considered an expert in the field (e.g., air quality, water quality, waste management, facility decommissioning).

Substantive Requirements. Substantive requirements are those requirements that pertain directly to actions or conditions in the environment. Examples include quantitative health- or risk-based restrictions upon exposure to

types of hazardous substances (e.g., maximum contaminant levels [MCLs] establishing drinking water standards for particular contaminants), technology-based requirements for actions taken upon hazardous substances (e.g., incinerator standards requiring particular destruction and removal efficiency), and restrictions upon activities in certain special locations (e.g., standards prohibiting certain types of facilities in a floodplain).

To-Be-Considered (TBCs). TBCs are non-promulgated advisories or guidance issued by federal or state government that are not legally binding and do not have the status of potential ARARs. However, in many circumstances, TBCs will be considered with ARARs as part of the Site risk assessment and may be used in determining the necessary cleanup levels for protection of public health and the environment.

Toxic Substances Control Act (TSCA). Toxic Substances Control Act, 15 USC 2601 *et seq*. and associated implementing regulations at 40 CFR 761.

Transuranic (TRU) Waste. TRU waste is any waste that is contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years, in concentrations greater than or equal to 100 nCi/gram at the time of assay. TRU waste mixed with hazardous waste is referred to as TRU mixed waste (TRM).

Zone I and Zone I(A) Ventilation Area. Primary enclosures, including any area in which the atmosphere is in direct contact with radioactive or other hazardous materials. Zone I enclosures are sealed enclosures (i.e., gloveboxes, chainveyors, and transfer boxes). Zone I(A) enclosures are Zone I enclosures with openings (i.e., hoods, B-boxes, and downdraft tables). Zone I ventilation areas must pass through a minimum of four independently testable stages of high efficiency particulate air (HEPA) filters prior to exhausting to the atmosphere.

Zone II Ventilation Area. Secondary enclosures, including any enclosed area (usually bounded by floor, ceiling, walls, and doors), which contain primary enclosures within their boundaries (e.g., Module A). Zone II areas have a possibility of being contaminated from primary enclosures. These areas require constant air monitoring using selective alpha air monitors (SAAMs) and air heads. The air from Zone II ventilation areas must pass through a minimum of two HEPA filters prior to exhausting to the atmosphere.

Zone III Ventilation Area. Tertiary enclosures, including those areas that surround or are adjacent to Zone II areas. Typically, these are corridors, cold shops, or office areas within the Contamination Area (CA). Zone III areas have no direct contact with Zone I enclosures and have only a very slight potential for becoming contaminated.

Zone IV Ventilation Area. Facilities or areas that are adjacent to a plutonium processing facility, but do not themselves contain any nuclear material (e.g., maintenance shops, offices, locker rooms).

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APPENDIX A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) FOR THE BUILDING 707 CLOSURE PROJECT

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APPENDIX B

SURFACE WATER MANAGEMENT PRACTICES

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APPENDIX C

BUILDING 707 CLOSURE PROJECT
RCRA UNIT-SPECIFIC INFORMATION SHEETS

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APPENDIX D

BUILDING 707 CLOSURE PROJECT IMPLEMENTATION SCHEDULE

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APPENDIX E

BUILDING 707 CLOSURE PROJECT DECOMMISSIONING OPERATIONS PLAN COMMENT RESPONSIVENESS SUMMARY

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